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THE ROENTGENOLOGICAL VISUALIZATION OF THE GALL BLADDER BY THE USE OF INTRAVENOUS INJECTIONS OF SODIUM TETRABROMPHENOLPHTHALEIN[1]

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IT HAS, of course, long been desired to get some material which, after entering the gall bladder, would make it visible to the X-ray—to enable more accurate diagnoses of lesions involving the gall bladder to be made. In looking around for a suitable substance, it was felt that certain requirements would have to be met. In the first place, it must be a substance which could be introduced by injection subcutaneously or intravenously, or could be given by mouth. This substance must be something which would be excreted almost entirely by the bile, and, further, enter the gall bladder, and, finally, it must be a substance which would not be toxic in the proportion necessary to produce a shadow. Therefore, before starting in, it follows that any substance which we may obtain to visualize the gall bladder must be a substance which will be excreted by the liver into the gall bladder through the bile. It, therefore, follows that if the function of the liver is disturbed so that any theoretical substance may not be excreted into the gall bladder, the visualization of the gall bladder will not occur; or, in the second place, it follows that if the cystic duct be obstructed, the substance will not be permitted to enter the gall bladder, and, therefore, there will be no roentgenogram of the gall bladder. Finally, it is necessary that the concentrating power of the gall bladder be good in order that the material which enters it may be concentrated to a sufficient extent to permit visualization with the X-ray.

Now, the halogen phenolphthaleins seemed to fulfill these theoretical requirements. Many years ago Abel and Rountree showed that phenoltetrachlorphthalein is excreted through the liver in the bile—approximately 95 per cent. We, therefore, thought that the most desirable substance to begin working with was some compound similar to this. Unfortunately phenoltetrachlorphthalein did not produce a shadow with the X-ray, therefore it was necessary to get something else. We first thought that by merely substituting iodine for chlorine we would have a desirable substance. We thought, as a matter of fact, that we could theoretically get a substance which would contain not merely four atoms of iodine analogous to tetrachlorine, but would contain eight atoms of iodine, which would, therefore, materially increase the amount of iodine, and, therefore, materially increase the possibility of shadow. Unfortunately, however, an octaiodophenolphtha-

[1]Read before the Radiological Society of North America, at Chicago, June, 1924.

lein is so toxic that it is impossible to use it. We, therefore, went at once to the tetraiodophenolphthalein, but, unfortunately, commercial preparations proved too toxic for use, perhaps because of decomposition products. It was, therefore, decided to try a bromine substitution product. We felt that an octobromphenolphthalein compound might be the desirable substance, because that would have a bromine content of approximately 68 per cent and would be excreted almost entirely into the gall bladder, and, therefore, ought to give a maximum shadow. Unfortunately, here again our efforts were in vain, because it is much too toxic to be used. Thereupon we resorted to the tetrabromphenolphthalein, which we now find satisfactory to use for the visualization of the gall bladder.

In our first publication on this subject, last February, in the *Journal of the American Medical Association*, we spoke about the desirability of using the calcium salt, because we had started with the use of the sodium salt and had not secured such good shadows in our experimental animals. Later we found that the fault lay, not in the sodium salt, but in the fact that the animals which received the sodium salt, by chance had food in their stomachs and duodenums, and we later found out it was the factor of the food that was responsible for the negative shadows we got. By mere chance the animals to which we gave the calcium salt had empty stomachs, and it was not until later that we realized that in order to get the proper visualization of the gall bladder it is necessary to have an empty stomach and an empty duodenum. The kind of salt used is of little consequence: it is not necessary to use the difficultly soluble calcium salt—one can use the readily soluble sodium salt.

The difference is very great in the matter of convenience, because formerly it was necessary to introduce about 350 c.c. of fluid to get the requisite 5 or 5½ grams of calcium salt into the individual, which was a great inconvenience. By using the sodium salt we have to use only 20 to 40 c.c. We do not like to use 20 c.c.—we like to use 40 c.c. fluid, because the extra-concentrated solution, as represented by the 20 c.c., if it escapes out of the veins into the tissues, is likely to cause a little necrosis. That, so far, has been obviated by the use of 40 c.c. of the solution containing about 5 grams of sodium salt for an ordinary size individual. The material is given intravenously, preferably in the morning before breakfast and preferably, also, in divided doses about half an hour apart. Twenty c.c. is given into the veins of the arm, then about a half hour's interval is allowed to elapse and the other 20 c.c. is given at the second time. This is in order to note whether or not the patient is going to have any toxic reaction. We have never had any cases of severely toxic reaction. We have had a number of cases of reaction characterized by a slight nausea and vomiting, occasionally a little dizziness, but these have all been temporary and not severe, and at the present time we think that we have found the reason for these reactions and can probably obviate any sort of disturbing reaction. I will come back to that at the close of my remarks.

After the injection, we do not permit the patient to eat anything until approximately the noon meal, and then only if he is really hungry. If possible, we prefer to have the patient go until the evening meal without any food whatever. He may drink water, but it is desirable to avoid food for the simple reason that the presence of food in the stomach or in the intestine apparently excites the gall bladder to empty itself. The material, therefore, which we wish to have concentrated in the gall bladder, in order to get a maximum shadow, is not concentrated and we are likely to get no shadow at all. If the patient stays in bed, it is preferable to have him lie on his right side after the injection, we think, although that may not be important. There is no objection to having him get up and walk around. We also, on theoretical grounds, give some sodium bicarbonate by mouth, approximately a teaspoonful two or three times

during the day, because, according to some experimental work of Dr. W. H. Cole, which is still unpublished, the presence of the sodium bicarbonate in considerable quantities in the stomach tends to shut up the sphincter of Oddi and therefore prevent the emptying of the bile out of the gall bladder. We do not know how important that is.

Now, as far as results are concerned, when we have followed out our technic, as described to you just now, and which you will find given in more detail in the *Journal of the American Medical Association* for May 31, 1924, in another little article which we have published—when we have carried out this technic rigidly we have not failed to get a shadow of the gall bladder except in five instances. In four of these later operation showed very good reasons why we did not get a shadow of the gall bladder. In three there was complete obstruction of the cystic duct by stone, therefore none of the dye could get into the gall bladder. In the fourth case there was only a fibrosed remnant of the gall bladder, due to a long-standing stone in the common duct. The fifth case really should not have received the dye. It was a case of appendix abscess of about three months' duration—a retrocecal appendix abscess. This case failed to give a shadow. At operation we found the appendix abscess first, and, therefore, did not go up to examine the condition of the gall bladder, and do not know at the present time what it was. There are other cases, however, which, theoretically, would probably fail to reveal a sharp visualization of the gall bladder. Those are cases in which there is a marked disturbance of liver function; consequently in extreme cases of cirrhosis of the liver, it is quite possible that no shadow would be obtained. At the present time, however, we have not yet had an opportunity to make the injection in any case of marked cirrhosis of the liver, so we cannot say positively about that, although we would predict that the shadow would be poor or perhaps entirely negative.

Now the best shadows, for reasons which I have already outlined, are obtained in normal individuals. So far as the interpretation of abnormal shadows is concerned, we do not know very much at the present time: we will have to learn this by more experience. I hope that if Dr. Carman is here he will tell us a little about his experience in the interpretation of these things. We do feel, however, that we have certain criteria for the establishment of the normal, and I believe I can best illustrate the normal condition of affairs and possibly also certain features of the abnormal condition, by making use of lantern slides. It is essential in carrying out this procedure, to get a series of X-ray plates. A single plate is of no value whatever; a series should be made for the same reason that a series of plates is made in a gastro-intestinal examination after a barium meal. We ordinarily make plates about four, eight, twelve, and twenty-four hours after the injection. It is essential that a series of plates be made. The first series of plates which I will show will be those of a normal individual who received 5 grams of sodium salt of tetrabromphenolphthalein. At the end of four hours there is no picture of the gall bladder; it has not yet begun to appear. At the end of seven and one-half hours the gall bladder is faintly appearing. Its edge is regular and sharply defined. The size of the gall bladder is also an important consideration. At the end of twenty-four hours it appears much more plainly, and the edge is a very sharp, regular border. It is only about half as large as it was in the previous plate. At the end of twenty-nine hours it has become smaller. At the end of thirty-two hours it has become still smaller, but is still plainly visible. At the end of fifty-four hours it is all gone again. One of the criteria of the normal condition in the gall bladder is, we feel, that the shadow should appear fairly early; that is, that there should be a good shadow, appearing by the end of the seventh or eighth hour, that the edge should be regular, of fairly sharp contour, and that

the gall bladder should show a good capacity for emptying itself by the fact that in the plate made twenty-four hours afterward the shadow should be considerably smaller than at the end of eight or ten hours.

The interpretation of stones in the gall bladder we have made in about eight instances. We need much more experience, however, in the interpretation of stones and it is difficult for anyone to describe very accurately how stones may be recognized, but usually they are recognized by an irregular mottling in the shadow of the gall bladder. One patient, although her gall bladder had a relatively normal edge and sharp contour, had mottling of her gall-bladder shadow, by little circular shadows. On the basis of this we operated on her and found several stones in the gall bladder corresponding to those shadows. We have confirmed a positive diagnosis of stones eight times—stones we have seen by this means. Occasionally the stones show up very well indeed.

We are not too sure about the interpretation of any of these shadows at the present time, but we do feel quite definitely that when the technic is followed out, as has been outlined, and we fail to get a shadow, it is very good evidence of one of two things: either very serious pathology of the gall bladder or a liver the function of which is seriously disturbed. Now, in general, we think that in probably 90 per cent of the instances it would mean a gall bladder with very definite gross pathology. We, therefore, regard a negative shadow as of the utmost value in the diagnosis of cholecystitis by this method.

A word or two about the toxic reactions. These may in part be due to impurities in very small amounts, perhaps even decomposition products. We hope that perhaps the manufacturers will be able to purify the product still further. As already mentioned, it is possible that the toxicity of the tetraiodo compound may in part be due to decomposition products, especially since organic iodine compounds, in general, are less stable than the bromine or chlorine compounds. The toxic effects can usually be aborted by the intramuscular injection of 0.5 to 1 c.c. of adrenalin, as suggested to me by Dr. Case.

DISCUSSION

DR. J. W. HUNTER, JR. (Norfolk, Virginia): I do not know how my series compares in number with the cases of Dr. George and Dr. Carman, of gall bladders examined by the usually accepted method, but I think that I can point with pride to a series of probably 300 cases that have been operated upon by my surgical friends in the city of Norfolk, Virginia, upon one general roentgenological finding, namely, that a gall bladder that throws a shadow upon the plate, or one that can be made to throw a shadow upon the plate, is a pathological gall bladder, though not necessarily a surgical one. We have also had abundant cases where the so-called medical drainage has been successful though deep down in my heart I have felt that a dose of salts, especially of the Carlsbad variety, would have relieved the patient almost as well.

The method as outlined by the essayist is most interesting. I do not know of any one thing in the roentgenological field that I have worked so consistently upon as the gall bladder. In the commonly accepted method, as I have just said, the diagnosis is made upon the finding of a shadow; in the new method it is the omission of the shadow that is important. It seems to me that it should supplement and not supplant the old method.

Of possibly 300 cases—I have not counted them—we have had many such as the following: The abdomen has been opened and what looked like a normal gall bladder, perfectly soft, no adhesions, etc., has been removed; but in almost every instance it has been found upon section to be pathological. In these cases, it is true, the patient had sufficient symptoms,—acidity, diffuse epigastric pain, etc.,—to justify the removal, but it is exceedingly interesting to note that the shadow of the gall blad-

der upon the plate was the corresponding roentgen finding.

Our internist friends cannot seem to get the word "history" out of their heads. The patient, of course, seeks relief. But it is our experience that there are only a few symptoms that we can consider of any great moment: first, the hyperacidity; second, the diffuse epigastric distress. In many cases the patient comes to you with a history of having had his appendix removed, but he still complains. You are going to find either a stone in the right ureter or a pathological gall bladder. In 90 out of 100 cases it is the gall bladder. The roentgenologist must decide.

The method that we have used is briefly this (and I do not believe that we have had an error of over 5 per cent), though nothing new: Spark gap of 4½ inches, 40 milliamperes of current, a cone, a Bucky diaphragm and the best double intensifying screens that we can find. We place the patient upon his abdomen and support his right shoulder and right hip. This helps to get rid of the vertebral column. The time of exposure varies according to the thickness of the individual.

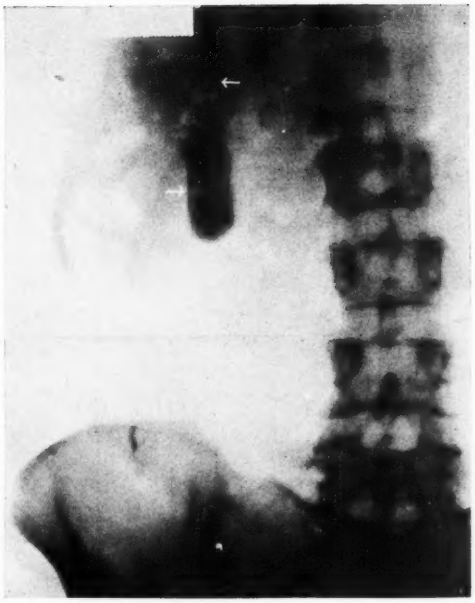

Fig. 1. Dr. LeWald's first case of *spontaneously* increased density of the bile. Note the presence of a number of gallstones of light density contrasting with the bile of increased density (lower arrow). Upper arrow points to stone containing calcium apparently lodged in the cystic duct. Increased density of the bile is probably associated with obstruction of cystic duct.

Dr. L. T. LeWald (New York): I have a couple of films showing *spontaneously* increased density of the bile. Two years ago at a meeting of this Society I showed one case (Fig. 1) and suggested that a method might be found such as Dr. Graham has evolved, in which artificially produced increased density of the bile would show gallstones of negative density. We went on with that work, taking gall bladders from the operating room and injecting sodium iodide into them, and were convinced that the method had every possibility of success.

This last slide (Fig. 2) is another case of *spontaneous* condensation of the bile, which shows two gallstones in the gall bladder. This perhaps is of value as a warning. I do not think any roentgenologist would think of going ahead with this work without taking a plain exposure, but inasmuch as a great many clinicians are taking this up, they might omit the simple technic of making an exposure before injecting the material, and thus might be deceived by the appearance soon afterwards of a completely outlined gall bladder, while as a matter of fact the cystic duct might be occluded. (Subsequent operation proved that in the above case—Figure 2—the cystic duct appeared to be occluded.) I would prophesy that as this technic improves it will be possible for a correct diagnosis to be made of carcinoma of the gall bladder as demonstrated by a filling defect.

Dr. H. J. Ullmann (Santa Barbara): I would like to make just one comment on the statement that any gall bladder that is visualized is pathological. I obtained my training in gall-bladder work by visiting Dr. George, and I was thoroughly convinced, until a few months ago, of the fact that the statement was true that any gall

bladder that visualized was pathological. One of our nurses in the hospital had typical gall-bladder symptoms, according to

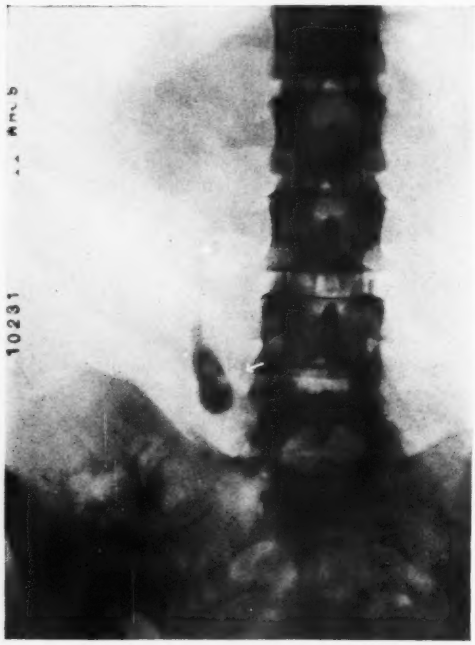

Fig. 2. Dr. LeWald's second case of *spontaneously* increased density of the bile. Gall bladder is contracted and contains two stones of light density (lower arrow). Upper arrow indicates a stone occluding the cystic duct. Confirmed by operation.

the two or three internists who had seen her. All agreed it was a gall-bladder case, and the surgeons concurred. I used the Potter-Bucky diaphragm and visualized a gall bladder. She was operated on by Dr. Lucius Hotchkiss and he found a perfectly normal gall bladder of the size described and a distinctly pathological appendix, which was removed, and she is now free of her symptoms. I have been rather conservative since then.

DR. L. R. SANTE (St. Louis): By and large among the roentgenologists of the country, I believe that gall-bladder diagnosis is not such a simple matter as it seems. I think, therefore, that the method which Dr. Graham and Dr. Cole have evolved is one of the best things which has happened in roentgenology in recent years, and I congratulate them upon their attainment.

I think that the method can be carried out in the examination of other organs,—for instance, pyelograms, etc., — and I understand it has been done by the Mayos with potassium iodide for this purpose. Other chemicals might be discovered which would be excreted into the ventricles of the brain. I think the big problem is up to the physiological chemist and the man engaged in this sort of work, to produce a dye excreted in these cavities which will be opaque to the X-ray.

I have had the opportunity of observing some of Dr. Graham's work and the work of this type carried on under his direction by Dr. Copher and Dr. Staley and Dr. Clancy, and I think it shows great promise and that we are going to learn a great deal about the physiology of the gall bladder which we formerly did not know.

Cardiac examination.—When vigorous pulsation of the left border and apex are present, there can be little fluid present. If the pulsations are feeble or absent, fluid is probable. However, heart failure of advanced grade may also give feeble pulsation. When a definite apex beat can be palpated and a metal marker is placed over the point of the apex impulse, examination by the roentgenoscope will, in the absence of pericardial effusion, show the apex marker squarely over the apex shadow.

J. D. CAMP, M.D.

Differential Diagnosis of Enlarged Heart and Pericarditis with Effusion. C. W. Perkins and B. Lattin. Am. Jour. Roentgenol. and Rad. Ther., Aug., 1924, p. 171.

THE ROENTGEN RAY AS AN AID IN ARTIFICIAL PNEUMOTHORAX[1]

By O. W. McMICHAEL, M.D., CHICAGO

EDITOR'S NOTE—*Dr. McMichael died October 2, 1924. His paper was given largely from topic notes, and we are indebted to Wilson Ruffin Abbott, M.D., for the preparation of this manuscript. Dr. Abbott, because of his life-long friendship and close association with Dr. McMichael, is peculiarly qualified to interpret the essayist's intent.*

THE secret of the value of the great advances that daily mark the progress of our profession in the battle against disease is the recognition of the need of every worker in every field of the help of every other worker in every other field. Each new discovery should be accepted by the clinician with reservation, until such time as experience proves its value beyond reasonable doubt. But its value having once been determined it should then become an integral part of his therapeutic armamentarium, available for use at the time and in the place determined by experience and experimentation.

There was a time when the doctor, called by us moderns the clinician, looked upon each new advance of the laboratorian as a fulcrum to the lever which would eventually deprive him of the inestimable attribute of success—his personality. The laboratory worker, a purely scientific investigator, was to ultimately supplant, rather than to supplement, the doctor, and the treatment of disease was to assume an element of scientific exactitude, comparable to the measurements of atomic spaces and molecular energies. We recall when it was common belief among us that by means of the X-ray the unseeing eye would be made

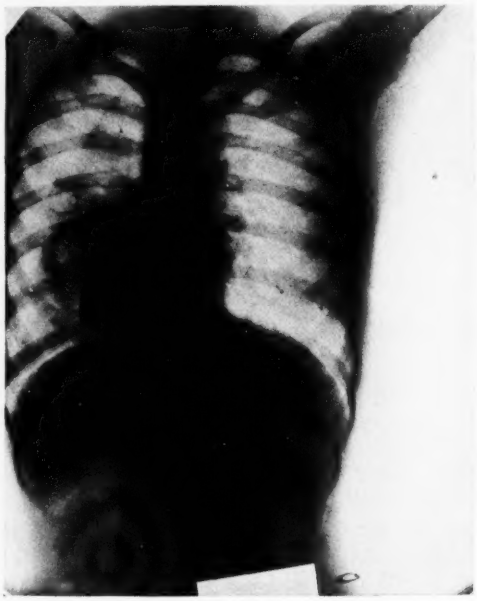

Fig. 1. The extensive involvement and destruction shown would lead one to expect adhesions and difficulty of collapse.

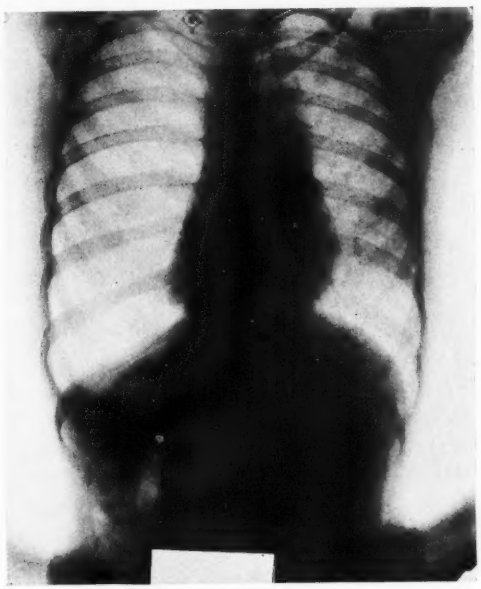

Fig. 2. Second plate of same case as shown in Figure 1, showing perfect collapse and increase of density in good lung.

[1]Read before the Radiological Society of North America, at Rochester, Minnesota, December, 1923.

to penetrate the depths of the obscure, and turn darkness into light.

Now although the efficiency of these aids is not to be denied, their limitations should be recognized and kept clearly in mind.

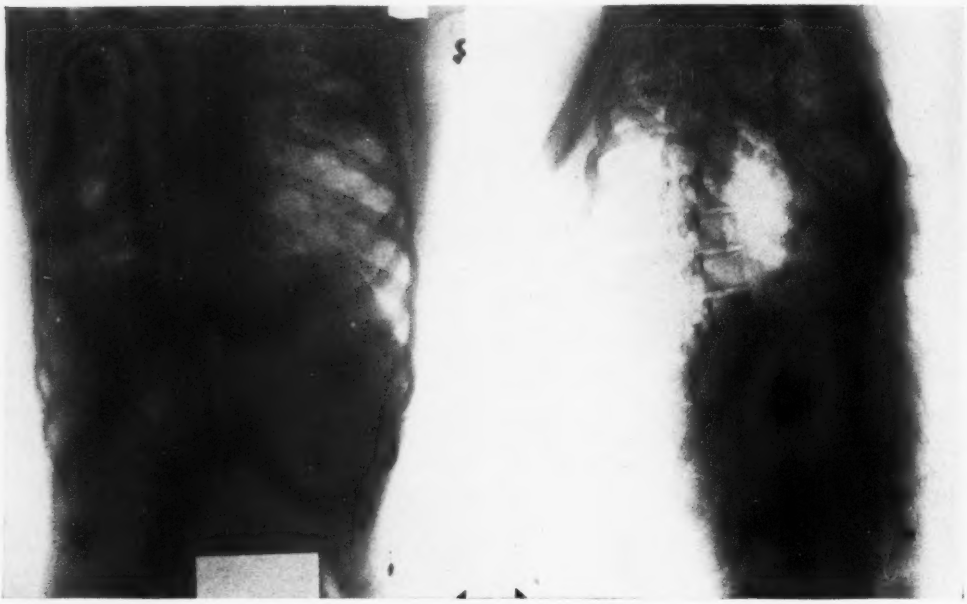

Fig. 3. This plate is presented to demonstrate the advisability at times of taking lateral views. Plates taken in the antero-posterior position show less air within the pleural cavity than is shown in the lateral views.

For instance, the discovery of the tubercle bacillus in the sputum of some tuberculous patients swept aside, for a while, the old painstaking methods of diagnosis, and it was considered by some no longer necessary to have a clinician diagnose tuberculosis. No tubercle bacilli, no tuberculosis, seemed a logical corollary—until one day a real clinician and diagnostician, reverting to methods which had been thrown into the discard, and recalling observations which had been designated obsolete, re-discovered the fact that the tubercle bacillus is only one indication of tuberculosis.

"And so," he said, "the microscope is not all-sufficient."

Then came the X-ray, with its mystic hiss and crackle, and once more we had a substitute for brains and hard work.

One day the roentgenologist emerged from his dark room and said, "The shadows show that this man has extensive tuberculosis—he has hardly any good lung left," but the clinician said, "The man isn't sick —he is only run down and has a little cough." Then they sat down to work it out together, and together they learned the great truth about tuberculosis: That the right time to make the diagnosis of tuberculosis is before the victim becomes ill, and that extensive tuberculous disease is compatible with apparent perfect health.

It would be interesting, possibly, to recite concrete examples by way of illustrating and lending force to this short preamble, but there have been many papers presented here this afternoon, and a number more interesting than I can hope to present, and I must at once set forth a few thoughts pertinent to the title of this paper.

About a hundred years ago, Carson, a physiologist, prompted by a clinical observation that cases of pulmonary tubercu-

losis oftentimes improved following the accident of spontaneous pneumothorax, in a paper before the Royal Society of London suggested lung collapse, artificially induced. But the paper seems not to have awakened the interest or courage of the medical fraternity to the extent of undertaking the procedure. Writers whose names I do not at this moment recall, but about the year 1835 and again in the early '60's, state that whereas it is agreed that improvement has followed spontaneous pneumothorax in pulmonary tuberculosis, one would not be justified in inducing lung collapse artificially.

Forlanini, in Italy, must have taken exception to these statements and beliefs, for we find him in the early '80's inducing artificial pneumothorax. We all know of the work of that preëminent among eminent surgeons, J. B. Murphy, who introduced the work into this country. Murphy, having demonstrated the technic, seems to have abandoned its practice, possibly because of the great demands upon his time in other fields of his profession. Since the time of these investigators the treatment has gradually grown in favor, until it is now in use in most of the institutions for the care of tuberculous patients. Those early pioneers induced lung collapse without the aid of the manometer, the X-ray plate, or the fluoroscope, and now, in the light of experience, we realize what risks they ran.

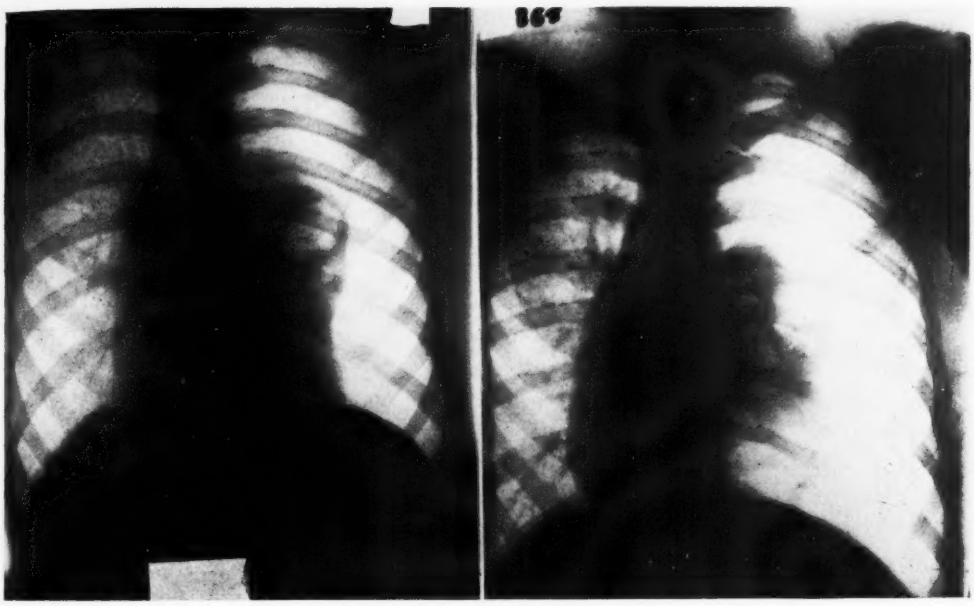

Fig. 4. A warning: thinning of cavity wall, a warning against too high positive pressure. Fair collapse after five months.

Probably in no field of endeavor has the X-ray more practical value than as an aid in the diagnosis and treatment of pulmonary tuberculosis and in the induction of artificial pneumothorax. It tells us oftentimes why we succeed—and why we fail. It warns us when we are in danger, and often turns threatened defeat into success.

I have come, not to teach, but to learn, and I am hopeful that some of you who see these slides will come to me and give me your helpful suggestions. For the excellence of these radiographs I am indebted

to my colleague, Dr. Maximilian J. Hubeny, whose skill and advice are always helpful.

Before proceeding to review these slides,

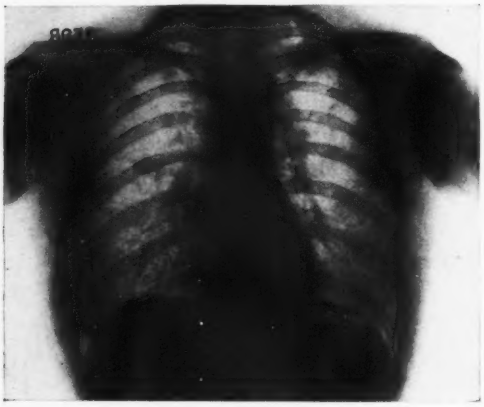

Fig. 5. Showing completely expanded left lung nine years after collapse had been maintained for one year.

I wish to reply to a question which was asked me a few moments before stepping to this platform. "How long should collapse of the lung be maintained?" Usually it may be stated that the minimum of time is from one to five years, too wide a latitude to be considered with any degree of exactitude. I will show you one slide which demonstrates a completely expanded lung nine years after collapse had been maintained for one year.

NOTE.—Dr. McMichael here presented a series of eighteen excellent slides illustrating types of collapse, accompanying each with appropriate remarks, pointing out difficulties which at times had seemed almost insurmountable. In cases cited, he had, by prolonged, careful, patient technic, been able to produce a degree of collapse seemingly impossible at the time it was undertaken. Unfortunately we are unable to present all of these, owing to Dr. McMichael's death. They would, likewise, lose much of their force, since we have not the remarks made by Dr. McMichael at the time.

Classification of head injuries.—This is a report of fifteen cases of head injury observed at the Misericordia Hospital, during February, March and April, 1923. They comprise the following injuries: (1) extradural and subdural hemorrhage with multiple fractures; (2) basal compression; (3) extradural and subdural hemorrhage; (4) concussion; (5) linear fracture without intracranial injury; (6) laceration; (7) concussion, subdural hemorrhage and compression without fracture; (8) concussion with hemorrhage, compression probably prevented by drainage through lines of fracture or lumbar puncture; (9) compound depressed fracture; (10) fracture of vault without symptoms of intracranial injury; (11) simple fracture of vault and laceration; (12) concussion and multiple lacerations; (13) fracture of skull without symptoms of brain injury; (14) compound fracture and concussion; (15) compound fracture.

History of the accident seldom helps in making diagnosis of head injury; a fall of but few feet or apparently insignificant violence has caused serious intracranial hemorrhage, while a fall from a great height has resulted in nothing more serious than a scalp wound. An uncomplicated fracture of the skull when the fragments are not depressed and when the line of fracture does not communicate with a wound in the scalp or mucous membrane is of little surgical importance. Fractures of the skull cause concern only in so far as they involve the contents of the cranium. Contrariwise, trauma to the head may cause severe intracranial damage without fracture of the skull.

W. W. WATKINS, M.D.

Head Injuries. John F. X. Jones and George E. Pfahler. Med. Jour. and Rec., May 7, 1924, p. 442.

THE NICHE AS THE ROENTGEN SIGN OF DUODENAL ULCER WITH A REPORT OF 42 CASES

A Simple Method to Aid in Its Visualization

By JOSEPH S. DIAMOND, M.D,. New York City

THE duodenal defect has been recognized, since Cole mentioned it, as the characteristic roentgen sign of duodenal ulcer. His studies, based on the direct evidence of duodenal pathology, helped materially to enhance the diagnosis of duodenal ulcer and proved the validity of the direct method of roentgen diagnosis. The indirect method is dependent solely upon functional disturbances and cannot supply more than presumptive evidence. Only end-results, such as gastrectasia, with all its concomitant manifestations of pyloric stenosis, can be regarded as immutable evidence of an organic lesion. The early signs of hyperperistalsis, hypertonicity and hypermotility are purely functional in character and are dependent upon the increased irritability of the autonomic nervous system. They are common to many conditions and may occur in simple vagotonia, as well as in all reflex gastric disturbances arising from intra- or extra-abdominal causes. These indirect signs may be readily compared to the clinical symptom group of pyrosis, belching, water-brash, etc., which are common to so many functional and organic conditions. They have no significance in themselves unless correlated with a definite clinical entity. Roentgenologically as well as clinically, the indirect signs merely help to draw attention to an existing lesion, without particularly specifying its character or location.

Cole's method, therefore, made the diagnosis of post-pyloric or duodenal ulcers possible in a larger percentage of cases. He established for the duodenum what Haudek had previously done for the stomach, *i. e.*, a method of diagnosis dependent upon the direct visualization of the lesion.

The morphological differences in the roentgen appearance between a duodenal and gastric ulcer, representing a filling defect in one and a pouching or niche in the other, were not clearly understood for some time. Cole attributed the filling defect on the duodenal contour to organic changes, such as induration of the ulcer or a cicatricial contraction in the walls of the duodenum. Carman later drew attention to functional spastic phenomena in the wall of the duodenum in the segment of the ulcer, which also produced filling defects.

Akerlund's (1, 2) recent studies, however, on the mechanics of the duodenum, and his ability to compare a large series of operative cases with the roentgen findings, aided materially in the elucidation of duodenal deformities and in the roentgen interpretation of duodenal ulcers. He found that the deformities occurring in duodenal ulcers were always due to a combination of organic and functional causes, and that the most constant manifestation of these ulcers was a niche, which was present in 60 per cent of his series. The functional deformities accompanying the niche were analogous somewhat to the gastric incisures occurring in the plane of the ulcer, these always disappearing under anesthesia.

In the latter part of 1922, studies along similar lines were undertaken by the writer (3) with the object of studying the frequency of duodenal niches, particularly in view of the fact that so few duodenal niches had been reported in the literature up to Akerlund's series. Forty-two cases of duodenal ulcers were studied, the results of

which are here reported. It was found that the ordinary roentgen examination seldom revealed the presence of niches, and that the associated muscular spasm usually interfered with the filling of the ulcer pocket. These muscular contractions may be readily compared with the intense blepharospasm

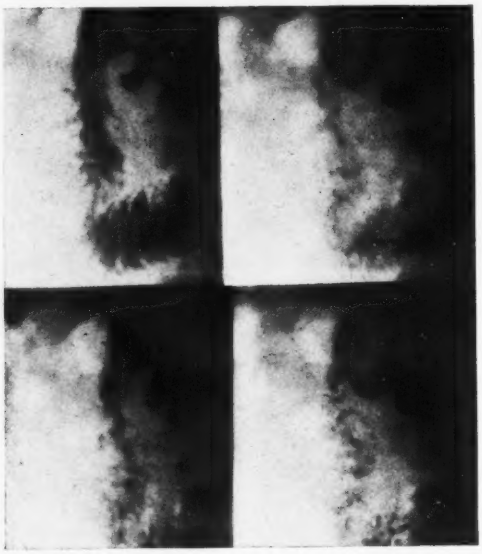

Fig. 1. Large niche at the lesser curvature border about half an inch away from the pylorus. Retraction of the lesser curvature border and a marked functional defect on the greater curvature side opposite the niche. Operatively proven case.

in corneal ulcers or with cecal spasms in tubercular ulcerations of the cecum. In all of these, the surrounding musculature contracts tightly about the ulcer-bearing area as a protective measure, not permitting the entrance of foreign or noxious substances. When, however, the spasm is obviated and the patient re-examined with the duodenum and pylorus in a state of complete relaxation, then niches or ulcer pockets similar to gastric ulcers can be readily visualized. A routine method was therefore adopted for the comparative study of duodenal deformities before and after the use of anti-spasmodics. This method yielded on subsequent examination as many as 66.6 per cent of niches in our series of cases. This method also afforded an opportunity to differentiate the organic from the functional deformity, the former remaining constant and the latter either disappearing entirely or lessened in intensity.

ANATOMIC CONSIDERATIONS

In order to properly understand the roentgen pathology of duodenal ulcers, the significance and causation of filling defects, and the filling of niches, it is necessary to possess a certain knowledge of anatomic and physiologic factors pertaining to the first portion of the duodenum, particularly the mechanism of its muscular structure.

The duodenum may be regarded structurally as a miniature replica of the stomach, the differences consisting merely in the size of the organ and its greater irritability. Its muscular distribution bears a marked resemblance to that of the stomach. The longitudinal muscular coat, while completely enveloping the duodenum, presents its greatest thickness along the lesser curvature border, forming there a thick bundle of muscle fibers. This bundle is about two and one-half centimeters in width and simulates somewhat the tenia coli. It forms a continuation of the muscle fibers on the lesser curvature border of the stomach and ends in the second portion of the duodenum. Some of these fibers enter into the formation of the duodeno-hepatic ligament, which is attached to the upper border of the duodenum and forms a suspension of the duodenal bulb. In view of the important rôle this band of muscle fibers plays in the mechanics of the first portion of the duodenum under pathological conditions, it may be named tenia bulb. duodeni.

The circular muscle fibers originate in the lesser curvature border and run somewhat arc-like, being parallel for a short distance to the longitudinal fibers, thus strengthening the bundle of fibers on the lesser curvature side.

This muscular arrangement of the first portion of the duodenum—plus its suspension by the duodeno-hepatic ligament—exerts a strong influence upon the visualization and location of niches and the roentgenological appearance of filling defects.

As is known, the place of predilection of ulcers in the duodenum, as in the stomach, is close to the lesser curvature. Any irritation arising from an ulcer in this region causes an increased tension in the longitudinal muscle bundle, which, by virtue of its stronger contractile power and its suspension mechanism, forms a fulcrum, toward which are drawn the circular muscle fibers in the same segment. The effect is twofold. First: the drawing upwards of the adjoining tissues causes the appearance of the ulcers in profile, as they would override the lesser curvature. Second: the localized contraction of the duodenum produces a narrowing of its lumen and gives roentgenologically the appearance of a filling defect, such defect being often mistaken for the ulcer base proper.

The roentgen deformities of duodenal ulcer must therefore be regarded as the result of a combination of two factors: (1) organic changes; (2) functional disturbances, each, as we shall see, assuming definite and characteristic forms.

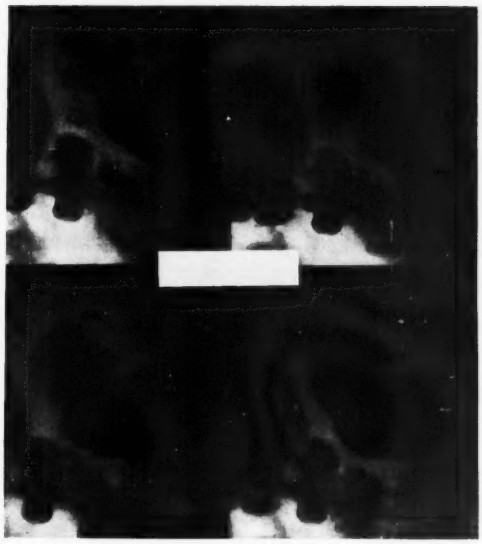

Fig. 2. Large niche on lesser curvature of the duodenum accompanied by retraction of lesser curvature border. Niche visualized only after relaxation of the duodenum by administration of belladonna and several days' restriction to milk diet. Operatively proven case.

CLASSIFICATION OF THE ROENTGEN DEFORMITIES IN DUODENAL ULCER

The roentgen deformities of duodenal ulcers may be classified as follows: (1) niche; (2) defect; (3) bulb retraction; (4) diverticulum formations. They may occur either singly or in a combination of any or all of these.

THE NICHE

The niche may represent any stage of pathological change in the duodenal wall from a simple non-indurated mucous ulcer to the penetrating and callous ulcer. Its filling and visualization are dependent upon the degree of irritability of the surrounding musculature. The slight constriction of the muscularis mucosa gives the niche a

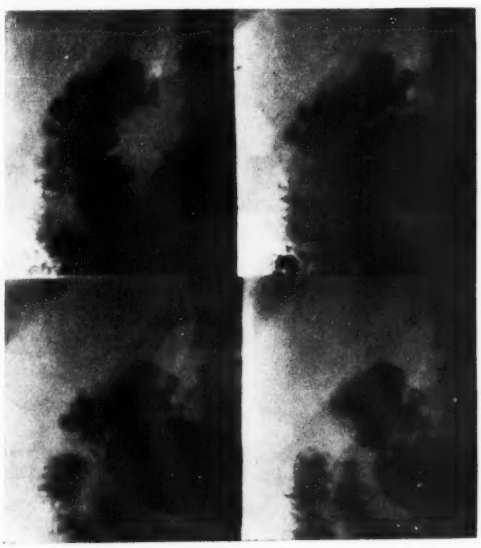

Fig. 3. Niche at the lesser curvature border of the duodenum with retraction of the same border. Also spastic incisura at the greater curvature border in the plane of the niche. Operatively proven case.

flask-shaped appearance (Figs. 1, 2, 3, 4). If, however, the irritability is too intense, then the entire musculature surrounding the ulcer-bearing area is puckered up in a state of undue contraction as a protective meas-

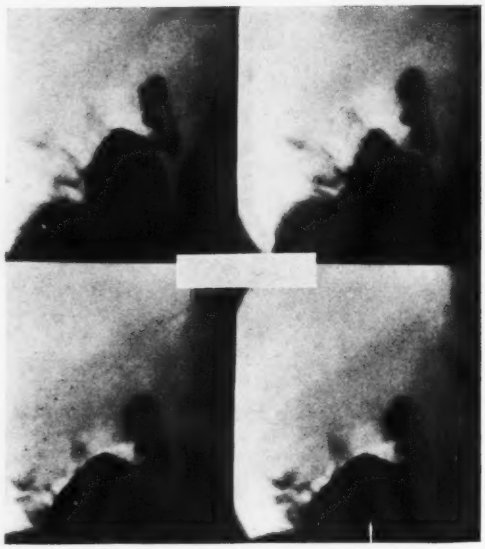

Fig. 4. Niche on the greater curvature of the duodenum visualized only on subsequent examination with the duodenum in the relaxed state.

ure and does not permit the contrast substance to enter the ulcerated area. By causing a relaxation of the duodenum, the filling of the ulcer pocket, as has been mentioned, becomes greatly facilitated. In our series, twenty-eight of the forty-two cases, or 66.6 per cent, could be visualized and interpreted as niches. Out of these, twenty-one were on the lesser curvature, six on the greater, and one was an enface (mid-surface) niche.

The functional deformities which accompany the niche are analogous to those found in the gastric ulcers of the lesser curvature type. They are, however, more constant and more pronounced on account of the greater irritability and small size of this organ. These deformities are (*a*) incisura or segmental contraction, appearing usually on the greater curvature opposite the lesion; (*b*) a puckering contraction in the imme-

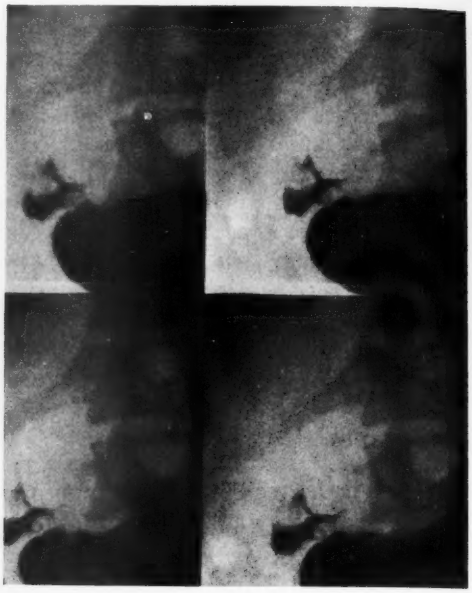

Fig. 5. Typical roentgen deformity of the duodenum before the administration of belladonna. Large spastic defect on the greater curvature side, retraction on the lesser curvature side and contraction at the basal portion close to the lesser curvature side.

diate vicinity of the niche, mostly found on the lesser curvature.

METHOD FOR THE RELAXATION OF THE DUODENUM AND FILLING OF THE NICHE

In order to relax the duodenum and facilitate the filling and visualization of the niche, the following routine method has been adopted. After the preliminary examination, the patient is administered twenty-five drops of tincture of belladonna q. four hours for forty-eight hours, simultaneously restricting the diet to milk, and at times even alkalies may be necessary. A marked relaxation of the pylorus and duodenum then ensues. The pylorus is seen gaping, and the duodenal lumen becomes widened and fills more completely. The spastic contractures become lessened or may disappear entirely, and the niche, which was not seen before, often makes its

Fig. 6. Same as Figure 5 after several days' administration of belladonna and restriction to milk diet. Notice complete relaxation of duodenum, with a well-filled niche protruding on the lesser curvature side.

appearance on the lesser curvature (Figs. 2, 3, 4, 6, 7, 8).

This procedure can also be utilized to good advantage in all conditions of reflex pylorospasm where the persistent constriction of the pylorus refuses to permit the escape of the contrast meal in sufficient quantities to fill the duodenum. It can also be employed in all reflex forms of duodenal irritation where the duodenum appears fleeting and irregular, rendering extremely difficult the differential diagnosis between an organic lesion in the duodenum and reflex irritability. In all these conditions, the above method allays the irritability of the pylorus and duodenum, and allows the proper filling and visualization of the duodenal bulb.

THE DUODENAL DEFECT

The term "defect" as hitherto used to describe duodenal pathology signifies a lack of filling of a portion of the duodenum, and embraces all changes in contour whether arising from organic or functional causes. The term used as such, however, is unspecific, as it does not specify the character or nature of the defect.

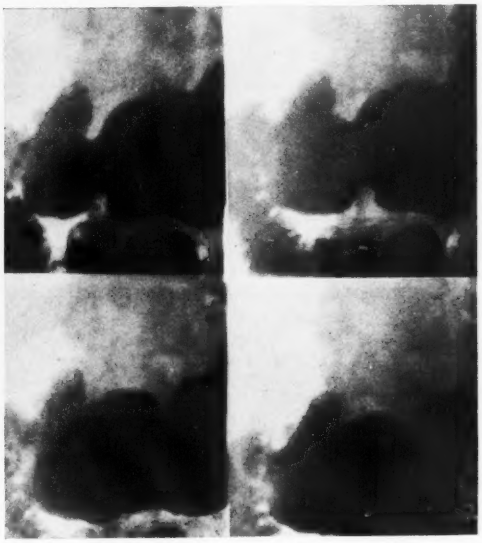

Fig. 7. Niche on the greater curvature side, duodenum completely relaxed.

MORPHOLOGICAL CHARACTERISTICS OF THE TWO DEFECTS

1. Organic defects are the result of ulceration, induration, cicatricial contraction, and adhesion. They are usually found on or close to the lesser curvature border. They are irregular in outline—they may be angular or notchy,—are constant in size, and are not influenced either in size or shape by the relaxation of the duodenum (Fig. 9).

2. The functional or spastic defect is due to the contraction of the circular muscle fibers in the same segment as the ulcer, the fibers being drawn up towards the fulcrum at the lesser curvature side. This functional defect is rounded in outline, is broad and often very deep, and possesses smooth borders, giving the appearance of a finger-print. It changes in size, varying often from one exposure to the next, and is greatly influenced by anti-spasmodic meth-

ods. It is almost invariably found on the greater curvature of the duodenum opposite the ulcer (Figs. 1, 2, 5), occasionally at the base of the duodenum, or in the region of the pyloric sphincter proper (Fig. 10).

Fig. 8. Niche on the lesser curvature side, duodenum completely relaxed.

Sometimes there may be an hour-glass deformity which is the result of a circular spastic contraction arising from both borders of the duodenum. When the irritation is intense, then the entire duodenum is contracted, reducing the lumen of the duodenum to the diameter of a match-stick or thread. Such strong contractions always interfere with the filling and visualization of niches (Fig. 5).

In prolonged medical therapy, the functional defects may disappear completely, while in the organic defect, little change in size or configuration is noted at any time, such defect remaining the same.

Organic causes play but a minor part in the formation of defects. These are always accompanied by the spastic factors which are the predominating component.

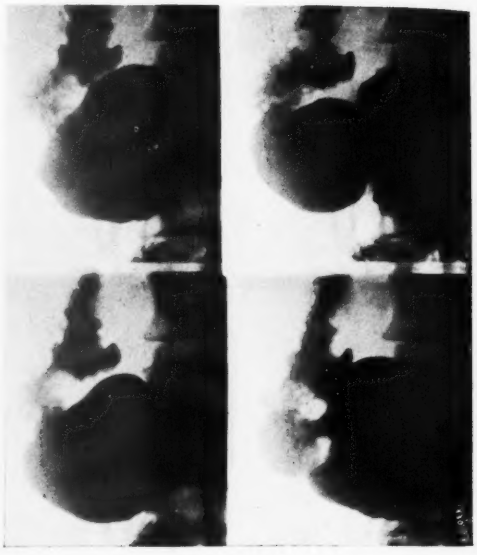

Fig. 9. Organic defect on the lesser curvature side. Old scar following acute perforation of the duodenum. Note the inconstancy of the functional defect on the greater curvature side opposite the scar.

In cases where a niche is not seen, due either to excessive induration or to the cicatrization of the ulcer, a spastic defect on the greater curvature side is invariably found, its presence always indicating an ulcer in the same segment on the opposite side.

Thirty-five cases, or 85 per cent, of the series presented defects, out of which 18, or 51 per cent, were associated with niches, and 17 were not. Of the latter, 8 were organic defects of callous ulcers and scars. The remaining 27 were all functional.

BULB RETRACTION

Retraction of the duodenum is another form of spastic contracture involving the longitudinal bundle of fibers along the lesser curvature, surrounding the base of a niche. The retracted side appears shortened and drawn in, giving the lesser curvature border a concave appearance, from the center of which a niche is often seen pro-

truding (Figs. 1, 2, 3). The bulb retraction bears some analogy to the gastric retraction which is occasionally seen in the saddle ulcer resulting in the snail form or tobacco pouch stomach, when the lesser curvature is

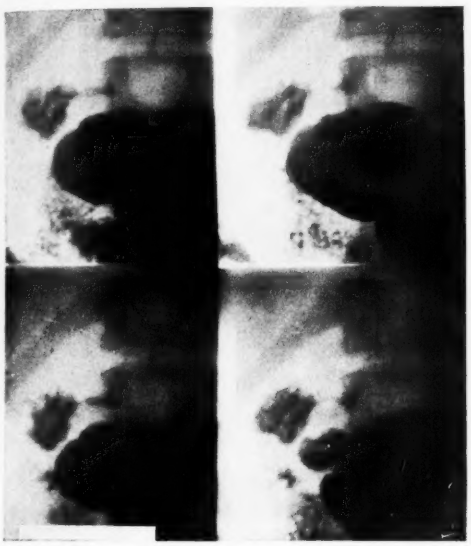

Fig. 10. Functional defect at the base of the duodenum accompanying mucous ulcer. Note small diverticulum pouch at the lesser curvature recess.

shortened and curled upon itself. Retraction was found associated with a niche in practically every instance.

DIVERTICULUM ASSOCIATED WITH DUODENAL ULCER

The diverticulum consists of a pouching of a portion of the duodenal wall situated in close proximity to the ulcer. Such diverticula may be often mistaken for niches and can be differentiated by their ability to contract, changing their contour from plate to plate. They are always situated proximal to the ulcer and their place of predilection is the basal portions of the duodenum (Fig. 10). Such diverticula were found in eight cases of our series.

CONCLUSION

In the interpretation of the duodenal deformities, an effort must be made to recognize the actual lesion taking place within the duodenum and express it from a pathological and anatomical standpoint. We must differentiate between a niche, infiltration, scar, and spastic contracture. Errors will be eliminated if one will follow a definite plan and apply himself to study minutely the character of the changes in each border, always bearing in mind the pathological entities which affect the duodenum and the manner in which they express themselves under the roentgen ray.

The indirect method is vague, indefinite, and confusing. It is dependent upon nervous motor phenomena and not upon the direct evidence of pathology in the duodenum. At its best, it leads but to presumptive evidence.

While the direct method is more painstaking, requiring serial radiography, greater technical accuracy, as well as finer interpretative study, its results are, however, positive.

SUMMARY

1. A roentgen study of forty-two cases of duodenal ulcer is here reported.

2. With the proper method of examination, the duodenal niche becomes the outstanding roentgen deformity of duodenal ulcer. It has been found in twenty-eight cases (66.6 per cent) of our series.

3. The various types of duodenal deformities, their causation and morphological differences are here discussed.

4. The architectural structure of the first portion of the duodenum, and the mechanical factors responsible for the formation of functional deformities are described.

5. The duodenal defect, hitherto regarded as the result of organic changes only, appears to be, in the majority of instances, functional in character, and is asso-

ciated with the niche. This defect can be lessened in size or made to disappear entirely when the duodenum is relaxed.

6. A simple method is mentioned to relax the duodenum and facilitate the visualization of niches, as well as to aid in the differential diagnosis between functional and organic changes.

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The mitral heart.—A review of the literature pertaining to this subject, with a summary of the more salient features of this disease.

In the ventrodorsal projection the silhouette of the mitral heart gives the form of an almost straight lined triangle with rounded edges. The broadening of the heart at the base is very characteristic and is largely responsible for this form, which is to be seen even in early well compensated cases. The heart appears long, its left border has an almost straight or step-ladder arrangement, giving the impression of having been stretched. This is especially so in mitral stenosis where there is no hypertrophy and even with atrophy of the left ventricle. Later on the ventricles dilate, the heart becomes enlarged in all its diameters and the transverse may equal or even be larger than the longitudinal diameter, a condition practically pathognomonic of mitral disease. The aortic curve appears smaller than normal, especially in cases of mitral stenosis, and this is due to the enlargement of the right ventricle causing a turning of the heart upward and toward the left. The different curves on the left border of the heart are much less prominent in mitral insufficiency than in mitral stenosis for the following reasons: (1) The conus pulmonalis is much more enlarged and dilated in mitral stenosis; (2) in mitral stenosis there is often an enlargement of the left auricular appendix which is superadded to that of the left conus and this increases the bulging of the curve; (3) lack of hypertrophy of the left ventricle in mitral stenosis helps to accentuate the prominence of the conus curve.

J. D. Camp, M.D.

Roentgenologic Evidence of Mitral Disease. Julius Ferber. Am. Jour. Roentgenol. and Rad. Ther., Oct., 1924, p. 321.

RADIO-ACTIVITY

By JOSEPH MUIR, M.D., New York City

WHEN we come to visualize the structure of the higher atomic weight elements, we are confronted with the difficulty of having to arrange a large number of electrons around a heavy nucleus. These electrons are to be arranged in orbits so that the physical properties of the elements may be explained by the structure assigned to the atoms. In the case of nitrogen, we would have to arrange seven electrons around the nucleus, while in the case of oxygen, eight electrons will have to be arranged.

The complexity of the problem grows as the atomic weight of the element increases, and we come to a point where the number of electrons in the atom is so large that the atom becomes unstable. This instability may be due to the large number of electrons and their distances from the nucleus, simultaneous with the heavy charge of the nucleus.

It may be said that no atom may be in equilibrium which has an atomic weight above a certain figure. That is, that no positive charge may exist in a nucleus above a certain figure and be in equilibrium.

If we change our method of analysis, and, instead of building up atoms, we start with the heaviest of all elements, uranium, we find that the magnitude of the nuclear charge of the uranium atom is very large compared to the nuclear charge of an atom of hydrogen. We may consider this atom of uranium as an hypertrophy, and therefore not in equilibrium. The result will be a tendency of re-arrangement of the atom to attain equilibrium. This re-arrangement causes the loss of some of the constituent elements of the atom, both of the nucleus and of the outside system of electrons. The energy acting within the atom forces this re-arrangement to take place gradually, and according to certain natural laws, so that the atom of uranium does not suddenly re-arrange itself to become a stable atom, but the changes are gradual and take place in definite, well defined steps. At each of these steps a new element is produced, and the production of this new element is always accompanied by the emission of rays.

Within the hypertrophic atom forces will act which will tend to relieve the atom of its overburdened capacity for positive and negative charges. In doing this the internal atomic forces will tear from the positive nucleus a small part of it, which will be projected from the atom at high speed. This may be accompanied also by a removal and projection of electrons from the atom. These two projections, or either of them separately, or the forces themselves acting on the atom, create electromagnetic disturbances which are transmitted through matter.

With the emission of positive particles, electrons, or electromagnetic disturbances, there is a decided change in the atom as a whole; in its structure and its properties. The arrangement of the electrons around the nucleus is changed whether the particle removed from the atom be from the nucleus or from the orbits, and this new arrangement necessarily indicates the formation of a new element.

Taking the heavy atom, uranium, and noting the new elements formed and the elements springing from these newly formed ones, we arrive at the list given below. This list contains information as to the succession of elements and also as to the particles torn and ejected from an atom at each step of re-arrangement of the internal structure of the atom.

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[1]This is the second of a series of papers on Radium. See *Radiology*, December, 1924, p. 521.

URANIUM-RADIUM FAMILY

Name	*Radiation*
Uranium 1	alpha
Uranium X	beta gamma
Uranium X	beta gamma
Uranium 2	alpha
Ionium	alpha
Radium	alpha
Radium Emanation (RADON)	alpha
Radium A	alpha
Radium B	beta gamma
Radium C	beta gamma
(99.97%) (0.03%)	(alpha)
Radium C	beta gamma
(side reaction 0.03%)	
End 0.03%	.....
Radium C	alpha
(main reaction 99.97%)	
Radium D	soft beta
Radium E	soft beta
Radium F (Polonium)	alpha
Radium G (end product)	
(Lead)	no rays
	Atom stable

To illustrate the nature of the particles mentioned above, let us take first the transformation of Ra. into Ra. Em. This transformation is accompanied by the emission of one alpha particle. This doubly positively charged particle is also called an alpha ray and shall be referred to as such. This particle must, of necessity, be expelled from the nucleus of the Ra. atom and in so doing it reduces the atomic number, that is, it reduces the amount of the positive charge of the nucleus by 2e.

The atomic number of the resulting element, Ra. Em., is then two units smaller than that of Ra., and is, therefore, two places behind Ra. in the Periodic Table. The atomic number being reduced by two units, the actual mass of the nucleus must be correspondingly decreased and the atomic weight is reduced by four units, and since the atomic weight of Ra. is 226, that of Ra. Em. must be 222. This is a typical example of an emission of an alpha ray by natural means. This alpha ray has the following characteristics:

The alpha rays are very readily absorbed by thin metal foil and by a few centimeters of air. They have been shown to consist of positively charged atoms of helium projected with a velocity of about $\frac{1}{15}$ the velocity of light. They are deflected by intense magnetic and electric fields, but the amount of deviation is minute in comparison with the deviation, under the same conditions, of the cathode rays produced in a vacuum tube.

In other transformations and re-arrangements of atoms, electrons are ejected from the atom and these electrons are known as beta rays, and shall be referred to as such. Since we know that this beta transformation, or emission of beta ray, results in some cases in the production of a new element, the beta electron must come from the nucleus, otherwise it would only cause an ionization; that is, the atom would become positively charged. This being the case, we must modify our conception of the nucleus. It must have not only a number of positive charges determining its atomic number, but also some more positive and negative charges neutralizing each other, which are bound mutually and to the nucleus. When an electron is removed from this supply of charges it causes one positive charge to be set free, and it will supply the nucleus with a positive charge to increase its nuclear charge. The atomic number is increased by one unit. There will be no reduction of the atomic weight, since the atom will draw to itself a free electron from the outside.

This external electron does not enter into the nucleus, but into the outer shells of electrons. A beta transformation is therefore immediately followed by a process of neutralization which renders the atom electrically stable and ready for the next disintegration, if such is in order.

The beta rays are on an average far more penetrating in character than the alpha rays, and consist of negatively charged bodies projected with velocities of the same order as the velocity of light. They are far more readily deflected than the alpha rays, and are in type identical with the cathode rays produced in a vacuum tube.

In alpha-ray emission there must also be a period of neutralization, since two positive charges have been removed from the atom. This neutralization takes place in the atom giving off two electrons to the outside. The alpha ray is identical in nature with the canal rays, which are artificially produced, and the beta ray is identical with the cathode ray.

There is still another emission of rays which occurs in the transformation of the atoms, and this is the gamma ray, which is identical in nature with the roentgen ray or X-ray. The nature of this ray is as follows:

The gamma rays are extremely penetrating, and non-deviable by a magnetic or electric field. Their true nature is not definitely settled, but they are analogous in most respects to very penetrating roentgen rays.

The naturally produced rays are in every case more penetrating and harder than the artificially produced rays, but their nature is identical.

SECONDARY RADIATION

The voltage in an X-ray tube causes the ejection of electrons from the primary cathode. These electrons, travelling at high velocities toward the anti-cathode, are cathode rays. When these rays strike the anti-cathode they supply energy which produces the emission of X-rays from the anti-cathode. So, *from a corpuscular radiation a wave motion radiation is obtained.*

Conversely, when an X-ray, or a gamma ray, of certain frequency impinges on matter, let us say a metal, it is capable of releasing from an atom of the metal an electron which will travel with a velocity depending upon the frequency of the wave motion radiation. This electron is a beta ray and is called a *secondary* beta ray. We have in this case a "theoretical" *transformation of wave radiation into corpuscular radiation.*

The energy of the wave motion radiation is taken up by the atom and appears as the kinetic energy of the electron ejected from the atom.

Energy, however, has to be used up in tearing the electron from the atom and in order to explain this change we must assume that the wave motion radiation supplies energy which effects a re-adjustment of the atom, in which the atom passes from a lower to a higher state of energy.

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Double kidney.—Ureteral duplication may be unilateral or bilateral, partial or complete. When complete and diagnosed by the urologist, the roentgen ray can add but corroborative data. If, however, the second meatus is overlooked and but one pelvis and ureter injected, then care is necessary in interpreting the finding, if the anomaly is to be detected. The relative size of the two pelves of the double kidney varies exactly as do the superior and inferior major calices of the single kidney. The caudal pelvis is usually the larger, often approaching the single kidney pelvis in size. In the six proved cases of bilateral duplication, there was a marked similarity in the outlines of the corresponding pelves of each kidney in the same individual.

J. D. CAMP, M.D.

The Necessity of Close Co-operation between Roentgenologist and Urologist in the Diagnosis of Double Kidney. R. C. Beeler and H. O. Mertz. Am. Jour. Roentgenol. and Rad. Ther., Aug., 1924, p. 157.

SYPHILIS OF THE SPINE

By ROBERT B. COFIELD, M.D., F.A.C.S., Cincinnati, Ohio

SYPHILITIC disease of the spine, similar to bone and joint syphilis elsewhere in the body, may be encountered following either the congenital or acquired forms of infection. It may manifest itself, first, as an *arthralgia* or backache; second, as a *necrosis of the vertebræ*, and, third, as a *Charcot spine* accompanied by cerebro-spinal degeneration.

Early manifestation of the disease in the congenital type is pain in the back due to a necrosis in one or more of the vertebræ. This may be accompanied by an interference of the functions of the spinal nerves in the region of the disease and by deformity, due to collapse of the vertebral bodies. In acquired syphilis any of the three types mentioned above may present themselves. It is not unusual to encounter the arthralgic type in either the secondary or tertiary stages of infection, but the gummatous type and Charcot spine are found only during the later stages of syphilis and may manifest themselves many years after the original infection.

The invasion of the spinal column by the spirochæta pallida is less frequently encountered than syphilitic disease of other bones and joints, it having been recognized only during the past fifty years as a rather rare possibility. Evans and Marshall (1) state that Verneuil appears to have been the first to call attention to the subject in 1879, and about the same time Fournier first described a case in detail.

The *arthralgic type* of syphilitic spondylitis is characterized by pain in the back (usually worse at night), sensitiveness on pressure over the affected area of the spine, pain on motion, and a consequent muscle spasm. These symptoms, when accompanying a history of acquired syphilis that is in its secondary or tertiary stage, are suggestive to say the least and call for further investigation through the aid of a Wassermann test and a therapeutic reaction. The roentgenogram of the spine does not disclose the disease in this type as there are no destructive lesions of the vertebræ and on account of the heavy musculature and rigidity of the ligaments it is impossible to demonstrate periarticular swelling or effusion into the joints.

Fig. 1. Gummatous involvement of the third and fourth lumbar vertebræ which was accompanied by a large psoas abscess.

The difficulties of differentiating this type of disease from backache produced by slight trauma, faulty posture and other types of infection are quite evident. Only through close attention to the patient's history, securing a positive Wassermann, and favorable reaction to antisyphilitic treatment can a definite diagnosis be made.

The *gummatous type* of syphilitic spondylitis is a complication of either congenital or acquired syphilis occurring only during the tertiary stage of the disease. The gummatous necrosis may affect any part of the vertebra, but, like tuberculosis, it is more apt to attack the cancellous tissue

of the bodies and early in its progress destroys the intervertebral disk. The lumbar, cervical and dorsal regions are most frequently attacked, in the order named. The symptoms commonly complained of are pain in the back (worse at night), stiffness and an inability to bend forward freely. Deformity may be present in the nature of a kyphosis. Physical examination often reveals a moderate degree of tenderness over the area of the spine involved, muscle spasm and rigidity. Whitney and Baldwin (2) lay great stress on the hypotonicity of the ligaments and muscles of the uninvolved portions of the spine. While new bone formation dominates the roentgenological picture in bone syphilis generally, this is not necessarily true in syphilitic spondylitis of the gummatous type; during the early stages of bone destruction hypertrophic changes may be entirely absent. In the more advanced stage, however, new bone formation may accompany the destructive process and in some cases complete bony ankylosis of a number of vertebræ may occur. The occurrence of other osseous lesions elsewhere in the body, that demonstrate a definite periostitis or bone hypertrophy, are of great aid in arriving at a diagnosis. The Wassermann reaction is notoriously unreliable in bone and joint syphilis, but should be made as a routine in all obscure diseases of the spine.

Fig. 2. Same case as Figure 1. After intensive antisyphilitic treatment there is firm bony union of the third and fourth lumbar vertebræ. Psoas abscess completely cured.

Fig. 3. Charcot spine showing extensive destruction as well as hypertrophic changes and a marked scoliosis in the lumbar region.

Differentiation of the gummatous type of spondylitis from tuberculosis of the spine is often a very difficult problem. Both diseases have a tendency to attack the bodies of the vertebræ with early thinning and disappearance of the intervertebral disk; both are prone to produce cold abscesses, the contents simulating each other very closely; both produce destruction of bone followed by deformity, and, in both, paralysis below the lesion is not an infrequent occurrence. In the early stages of syphilis, as well as tuberculosis, the roentgenogram will show atrophy and destruction of the vertebræ

without new bone formation, while in the later stages new bone formation is frequently observed in syphilitic spondylitis and occasionally in tuberculosis of the vertebræ. The author (3) has previously demonstrated that tuberculous spondylitis shows a natural attempt toward spinal fixation by hypertrophic bone changes in at least 10 per cent of cases in adults.

In syphilitic spondylitis there is less pain on motion than is usually encountered in tuberculous spondylitis. Sensitiveness on pressure over the affected portion of the spine is not so severe and hypermobility of the spine in uninvolved areas is in marked contrast to that seen in Pott's disease. Recovery, with firm bony ankylosis following antisyphilitic treatment, will confirm the diagnosis.

Charcot disease of the spine is not frequently encountered and until recently was rarely recognized. Charcot himself did not have a case in his series. Funsten states that Rotter, in 1817, described 112 cases of Charcot's joints—none were in the spine.

Charcot joints, whether in the spine or elsewhere, are recognized at the present time as being invariably due to syphilitic infection which has previously produced a cerebrospinal degeneration. In the Charcot type of spondylitis there is often marked deformity of the spine, with little or no pain. The patient may complain of weakness of the back and some limitation of motion, but rarely is pain complained of, even though the deformity is quite severe. The deformity disappears to a great extent when the patient lies prone or is suspended, due to the absence of muscle spasm. Hypermobility of the spine in the unaffected areas is strikingly noticeable. Distinctive evidences of locomotor ataxia are usually present. The Wassermann reaction may or may not be positive. The roentgenogram shows irregular destruction of the vertebræ, with extensive new bone formation.

The diagnosis of Charcot spine is not usually a difficult one, but differentiation may be necessary from conditions such as Pott's disease, hypertrophic osteo-arthritis, syringomyelia, malignant disease, old compressed fractures and Paget's disease.

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Cystic formation in kidneys.—Occlusion of the urinary tubules seems to be the pathogenesis of cystic formation in the kidneys. The extent of the process depends on the number of tubules occluded. Excepting in the congenital type, the active symptomatology may be delayed well into adult life, even into the fourth decade. Dull pain in the back and loins, persistent headache, frequent urination, occasional hematuria, tumor, ptosis, polyuria, toxemia, uremia, backache or abdominal pain are some of the symptoms.

Careful urological investigation is essential. Pyelography gives a characteristic picture which is quite conclusive. Usually the kidney will receive painlessly several times the normal amount of fluid. There is a definite irregularity of outline which must not be confused with kidney tumor. The irregularity is more or less circular, size depending on the cysts; there is cupping and broadening of the pelvis, with obliteration or shortening of the calices.

W. W. Watkins, M.D.

Symptomatology and Diagnosis of Polycystic Kidney. John H. Morissey and Frederick W. Smith. Med. Jour. and Rec., May 21, 1924, p. 494.

APPENDICITIS AND LESIONS COMPLICATING ITS DIAGNOSIS: DEDUCTIONS FROM X-RAY EXAMINATIONS[1]

By SAMUEL B. CHILDS, M.D., DENVER, COLORADO

THE use of the X-ray as an aid in the diagnosis of acute appendicitis is seldom advisable except for the exclusion of a calculus in the kidney or ureter or the location of a pneumonia which may be entirely responsible for the symptoms referred to the appendix area. In chronic cases, however, the X-ray visualizes certain deviations from normal which are indicative of this condition. In locating these abnormalities a fluoroscopic examination is essential. Anatomists mention the fact that changes are found in the lumen of the appendix as age progresses. Morris in his textbook on Anatomy states: "The lumen of the appendix is found to be totally or partially occluded in at least one-fourth of all adults and old bodies examined." Some consider this due to the atrophy of the adenoid tissue, others, to disease.

In the consideration of this subject the writer includes only that form of pathology in the appendix which is associated with definite symptoms, closely simulating those produced by ulcer of the stomach or duodenum or by disease of the gall bladder. Some of these cases give no history of having had an acute attack of appendicitis. The permanent relief after the removal of the appendix, however, demonstrates that the pathology in the appendix was the cause of the symptoms.

Several members of this Society, as well as others, have written upon this subject within the past few years and have emphasized certain cardinal points which are accepted by roentgenologists as indicative of a diseased appendix. I shall ask your indulgence while they are reviewed briefly, with personal comments.

1. A visualized appendix constantly tender to palpation. This is considered one of the most reliable signs, but tenderness in the right iliac fossa, unless so limited, can be caused by several other conditions and should not be assumed to indicate a pathological appendix. In addition to the value of localizing tenderness in the appendix, it is important for the surgeon to know the location of the cecum and appendix that he may decide upon the line of incision in cases in which it is deemed advisable by him to palpate the gall bladder or duodenum, as well as to remove the appendix through the same opening.

2. A persistent kink or angulation in the appendix. This is also a reliable sign of pathology and is generally due to an adhesion at the point of angulation, or to a short mesentery.

3. Delayed emptying of the appendix. A visualized appendix after the cecum and ascending colon are empty denotes faulty drainage and forms an important link in the chain of pathology.

4. A bulbous tip with small lumen near the cecum. This condition is ideal for a poor drainage system and in this type slow emptying occurs in the majority of cases.

5. Fixation of the appendix by adhesions throughout its entire length or at its tip only. This is not considered *per se* sufficient evidence for its removal.

6. The presence of concretions. Considered contributory evidence of pathology.

7. A segmented appendix. Not considered reliable unless associated with some of the other signs above mentioned.

These signs are arranged in the order of their reliability, according to my observation. The greatest accuracy will be obtained in the diagnosis of chronic appendicitis, however, by a combination of three of the different headings mentioned, two of these factors being found under the first four cited. Indirect evidence consists of pylorospasm, delayed motility of the stomach, ileal and colonic stasis, and occasion-

[1]Read before the Radiological Society of North America, at Kansas City, December, 1924.

ally spasticity of the colon. In the writer's experience, the detection or the exclusion of a co-existent organic lesion within the abdominal cavity is even more important than the finding of changes which indicate a chronic appendicitis.

The lesions complicating the diagnosis of appendicitis are rather numerous. Among these the following conditions are mentioned: Tubo-ovarian disease, calculus in the kidney or ureter, ulcer of the duodenum or stomach, cholecystitis, Lane's kink, Jackson's membrane, diaphragmatic pleurisy, a dilated cecum and ascending colon with sharp hepatic flexure, cancer and tuberculosis of the cecum, mesenteric lymphadenitis and an affection of the spinal nerves, a condition mentioned by several surgeons and described by Freeman[2] under the head of the neurotic or irritable abdomen.

The roentgenologist, who makes several gastro-intestinal examinations daily, is impressed with the fact that not infrequently a patient will give the history of having had his appendix removed with but little if any permanent relief of his symptoms. It is unfortunate from a scientific standpoint that in many cases the appendix is considered to undergo changes with age, and that the report comes from the laboratory that the appendix is pathological in these cases. As Carman and others have pointed out, the diagnosis of chronic appendicitis is a reasonably safe one to make from the laboratory standpoint. I feel sure, however, if sufficient attention were paid to the detection of some co-existent lesion, not only would the pathologist's report be the same for the appendix but the patient would also be permanently relieved of symptoms after the co-existent lesion had been treated surgically, as well as the appendix.

Tubo-ovarian disease can give tenderness in the right iliac fossa, similar to that occasioned by chronic appendicitis, but a physical examination should detect its presence. The fact that many ovaries have been needlessly sacrificed on the surgical altar is a well-known fact. In some of these cases the ovary could have remained in its normal place and performed its normal function if an X-ray examination had preceded operation, as exemplified by the following case.

Miss M., age 30, gave a history of pains in the abdomen, referred at times to the right, at other times to the left inguinal region. She also complained of symptoms referred to the stomach. From a clinical diagnosis of chronic appendicitis, the appendix was removed, with no relief of symptoms. About a year later the left ovary was removed by the same surgeon, with no relief of symptoms. Some time later she consulted a urologist who referred her for an X-ray examination. A small calculus was found in the middle third of the left ureter. This was removed by Dr. T. Leon Howard, of Denver, and the patient made an uneventful recovery, with permanent cessation of all abdominal symptoms. Similar experiences could be mentioned, doubtless, by many roentgenologists, for the detection of a stone in the genito-urinary tract in patients who have had the appendix removed is not uncommon.

An ulcer of the duodenum is not infrequently found by an X-ray examination in a patient who has had no permanent relief after the removal of the appendix on an incomplete diagnosis of chronic appendicitis. I have been impressed with the fact that practically all of this class of patients state that the symptoms are the same as before their operation, a rather convincing proof that the ulcer of the duodenum was the cause of all the symptoms, and the appendix, although stated by the pathologist to be diseased, was only a silent partner in the symptoms but likely was the cause of the ulcer. After the ulcer has been treated successfully, either by surgery or therapy, the patient is relieved of his symptoms.

A diseased gall bladder is frequently co-existent with chronic appendicitis and although the X-ray examination may not

[2] *Annals of Surgery*, Nov., 1924.

show positive evidence of its existence, yet there may be sufficient contributory or indirect evidence for the roentgenologist to mention his suspicions to the surgeon. Provided the condition of the patient permits, it is far better for the surgeon to explore a suspicious area at the time of operation and correct any pathology, if present, than to find a second operation necessary, if only the appendix is removed. Failure to relieve a Lane's kink or to remove a Jackson's membrane may be the factor which prevents the relief of the symptoms, if only the appendix is removed. The roentgenologist can give reliable information on these points, and should always give additional information about any other pathology detected in the right iliac fossa.

In the writer's experience the appendix is visualized in over 70 per cent of cases when barium is taken by mouth. This agrees closely with the figures given by George and others. Probably some of the non-visualized appendices are post-cecal. An X-ray diagnosis of chronic appendicitis without a visualized appendix is unreliable and unwarranted. The fact that the appendix is visualized is not considered of any pathological significance unless conditions are demonstrated, as previously mentioned. Statistics show that the removal of the appendix upon a clinical diagnosis of chronic appendicitis fails to relieve the symptoms in a large number of cases. Surgeons report that the removal of the appendix upon the report of the roentgenologist also fails to relieve the symptoms in a considerable number of cases. Aware of these facts, the writer, for a number of years, has deemed it necessary to exclude as far as possible any co-existing lesion in the gastro-intestinal tract and has considered that, in cases referred to him with a clinical diagnosis of suspected chronic appendicitis, the clinician or surgeon feels reasonably sure of that diagnosis, but especially desires to know whether any lesion exists outside of the appendix which, either wholly or in part, is responsible for the symptoms.

Our routine method of examination is as follows: A complete history relative to the gastro-intestinal tract is taken. If symptoms suggest the possibility of the existence of a calculus in the kidney or ureter, films are made of these areas. Films are made also of the gall-bladder area prior to the taking of the barium mixture. The chest is then viewed with the fluoroscope, especially for adhesions of the diaphragm or cardio-vascular changes. After the barium meal has been taken the stomach and duodenum are examined with the fluoroscope, and the findings are noted. The extra information gained by this technic has been found of great value to the surgeon, and the time required by the roentgenologist is comparatively short. At the end of six hours the patient returns to determine any delayed motility of the stomach and for evidence of stasis in the ileum or other abnormal conditions in the small intestine. The appendix is generally not visualized at this time. The patient returns for 24-hour and 48-hour examinations and afterward, if necessary, to learn the emptying time of the appendix as well as that of the cecum, for anatomically a normal appendix should empty in about the same time as the cecum. A post-cecal appendix is at times visualized only when the cecum is empty. A post-cecal appendix with tip pointing upward is generally fixed by adhesions, and produces definite symptoms. Any deviations from normal in the colon are noted.

The clinical history, the fluoroscopic findings and the films are reviewed before a résumé of the case is attempted.

The writer called attention to the importance of the correlation by the roentgenologist of the clinical and X-ray findings in pathological conditions in a paper read before this Society in 1920 and published in the *Journal of Radiology* for March, 1921. The value of such correlation is shown by the following case.

Mr. B., aged 35, a patient of Dr. I. B. Perkins, of Denver, was referred for an X-ray examination of the right kidney. A diagnosis of stone in this kidney had been

made before he consulted Dr. Perkins. While the patient was passing a specimen of urine in the doctor's office he experienced a sharp pain in the urethra near the meatus, and passed a thin piece of stone, accompanied by quite a little blood. This thin piece presented the appearance of having been detached from a larger stone. The film of the right kidney showed the presence of a stone in its pelvis. The clinical evidence consisted of a leukocyte count of 20,000, tenderness in the right side of the abdomen, and rigidity which extended from the free border of the ribs well into the right iliac fossa. The temperature ranged from 99.5 to 101 and the pulse was somewhat accelerated. The patient had not felt well for a week. Here, apparently, was a case where the X-ray and the clinical evidence did not harmonize.

When consulted for an opinion, my advice was that the evidence of a stone should be disregarded for the present, as the symptoms were those of an acute appendicitis rather than those of a kidney stone. The usual incision for an appendix was made and a gangrenous appendix with walled-off abscess was found. The patient made a good recovery. His subsequent history is not known as he left the city immediately afterward.

In the *Journal of the American Medical Association*, under date of October 24, 1924, Dr. Bettmann, of Cincinnati, makes the following comments: "I cannot enter here on the general subject of the roentgen-ray diagnosis of appendicitis. There is no doubt, however, that many roentgenologists make the diagnosis of chronic appendicitis with the greatest recklessness." He also states: "Lastly, it must never be lost sight of that the roentgenologist, as his very greatest contribution to the diagnosis, can merely make anatomic observations and describe them."

We, as roentgenologists, are criticized for making a diagnosis of chronic appendicitis, and perhaps justly so, if no definite attempt has been made by us to find or exclude the presence of any co-existing lesion. The roentgenologist, however, has just cause for criticism of any clinician or surgeon who is willing to have his patient operated upon for chronic appendicitis before he is reasonably sure that no other organic lesion exists in the gastro-intestinal tract which may be the cause of the symptoms, either wholly or in part.

Dr. Lahey, in the *Boston Medical and Surgical Journal*, under date of July 14, 1921, in speaking of the importance of roentgenology, says: "Expertly applied, wisely interpreted and properly correlated, no one can question its inestimable value."

If the roentgenologist's greatest contribution to the diagnosis is, as stated by Bettmann, merely an ability to make anatomic observations and describe them, it is the fault of the roentgenologist if his clinical experience does not warrant his correlation of the evidence. Until the roentgenologist realizes that his true position is that of a consultant and until he equips himself for this dignified position, roentgenology as a specialty will never be accorded its rightful place in diagnosis by the profession.

Blood groups.—Three hundred and fourteen cases of malignant disease were studied with regard to the possible relation of blood groups to malignant disease and the effect, if any, of radiotherapy upon these groups. The authors found that neither age, sex, weight, height, complexion, health, sickness nor region affected had any influence on the normal average relation of blood groups. Neither could they detect any alteration in the blood group as a result of irradiation, roentgen sickness, or the progress of malignant disease. Duration of the disease before or after treatment showed no influence; disappearance or progression of malignancy had no influence. The relative percentages of blood groups was found to be the same as those which have been recorded under normal conditions.

J. D. CAMP, M.D.

The Relation of Blood Groups to Malignant Disease and the Influence of Radiotherapy. George E. Pfahler and B. P. Widmann. Am. Jour. Roentgenol. and Rad. Ther., July, 1924, p. 47.

POSSIBILITIES OF DEEP X-RAY THERAPY WITH THE COOLIDGE WATER-COOLED TUBE AND HEAVIER TRANSFORMERS[1]

By ROBERT E. FRICKE, M.D., Howard A. Kelly Hospital, BALTIMORE, MD.

THE purpose of this paper is not to describe any new form of therapy, but to present the apparatus and technic of a more intense application of X-rays than has hitherto been employed in treatment. Treatment of deep-seated lesions with X-radiations has progressed markedly within the past few years. The American type of closed, oil-encased transformer

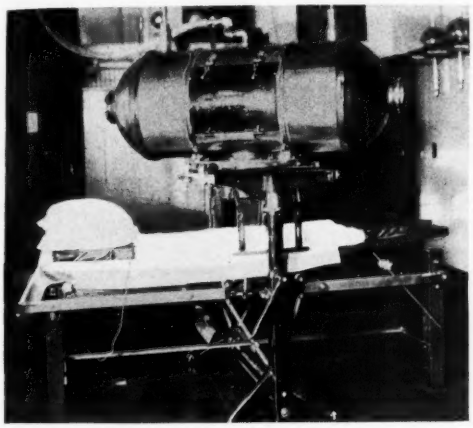

Fig. 1. Treatment room with a Wappler deep therapy machine, showing overhead apparatus; operator's room at left; wooden box in background contains the transformers and all the machinery except the motors for the fans. This installation would possess too much electrical danger for use with the new high-intensity machine.

superseded the German open-core type; the gas tube was replaced by the hot cathode tube; machines thus came into use which could function continuously over many hours at a potential of two hundred thousand volts and an intensity of four or five milliamperes. The rays emitted were of a longer wave length and far less penetration than the gamma rays of radium, but possessed a beneficial therapeutic action in the field of malignancy and allied conditions, a form of ray therapy being thus developed by which treatment could be rapidly administered over a wide area, including the growth and its lymphatic connections.

The search continued for more powerful transformers and for a type of vacuum tube which could carry higher amperage and higher voltage. A year ago Coolidge reported a water-cooled tube which with adequate transformers generates a far more powerful X-ray beam than has as yet been achieved in X-ray manufacture.[2]

We have been operating a Wappler machine (Fig. 1) functioning at two hundred thousand volts and four milliamperes for a couple of years, with complete satisfaction and uniformly gratifying results. When Coolidge perfected his invention, however, we hastened to install one of his water-cooled tubes for the sake of the heavier output promised. None of the stock transformers on the market appeared to have sufficient capacity to deliver a stable output at this high amperage and voltage; so we appealed to Dr. Waite of the Waite and Bartlett Manufacturing Company of Long Island City, N. Y. Dr. Waite constructed special heavy transformers which have proven most reliable.

Working with this system, we have a complete water circulation under forty to fifty pounds pressure; the X-ray tube is kept at an even low temperature during its excitation by the flow of water through a seamless coil of copper pipe behind the tungsten target. A large automobile radiator of copper mesh with an eighteen-inch fan serves to maintain the low temperature of the water system. The X-ray tube is eight inches in diameter. There is a projecting molybdenum pin in the filament spiral which produces a more uniform heat gradient by producing a large focal spot.

We have been able to operate this machine at two hundred and fifty thousand volts and fifty milliamperes, but for practi-

[1]Read at a meeting of the Baltimore City Medical Society, November 21, 1924.

[2]COOLIDGE, W. D., and MOORE, C. N.: A Water-cooled High Voltage X-ray Tube. Am. Jour. Roentgenol. and Rad. Ther., Nov., 1923, p. 884.

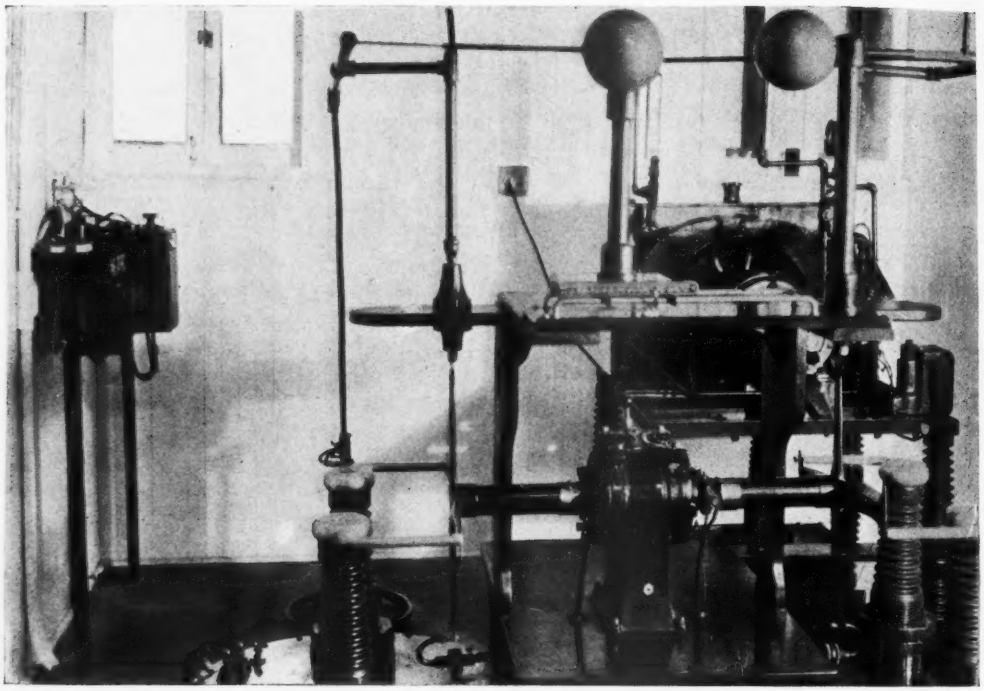

Fig. 2. Machinery of high-intensity apparatus (in basement). The transformers, sphere-gaps, rectifiers, and synchronous motor show in the foreground; the automobile radiator and fan for cooling the water system are in the right background; at the left are the various fuses and controls, all operated from a room upstairs.

cal purposes of treatment we use two hundred and forty thousand volts and forty milliamperes.

ADVANTAGES OF THE WATER-COOLED TUBE

Comparative electroscopic measurements of this new device and of our old two hundred thousand volt machine prove the former apparatus to possess twenty times the power generated by the old machine. In other words, we can complete a treatment in one-twentieth of the time previously consumed.

Many advantages of the heavier output are apparent. Firstly, we can give a high depth dose into a growth by means of cross-firing through many small portals in a very short time; this is far more easily borne by the patient, who formerly had to maintain one position rigidly for hours. Secondly, the application of the rays is more exact, as it is far easier for the patient to hold the required position for a few minutes than for two hours or longer. Thirdly, and most important, complete dosage can be administered in one sitting, a method we find best in radium therapy. Our radium experience has shown, in dealing with carcinoma anywhere in the body, that the most effectual treatment consists in massive dosage applied at the first visit of the patient. The broken dose method was almost necessary with the older apparatus and while it yields satisfactory results in some cases, it is, we are confident, not only more difficult to adequately apply but less likely to achieve the result aimed at. Fourthly, we hope to diminish or abolish entirely radiation sickness, as the shorter exposure decreases radiation of the blood stream and should lessen deleterious systemic effects. With the older technic, two and a half hours proved to be the longest exposure any patient could tolerate. In thirty cases treated

to date, we have had very little radiation sickness, even though multiple portals were rayed at the same sitting. Two patients I have in mind received twenty minutes' continuous treatment over four lower abdominal areas, corresponding to seven hours with the older technic; they suffered no upset whatever. Several patients who had always been nauseated by radium treatments received the new X-ray therapy without any ill effects.

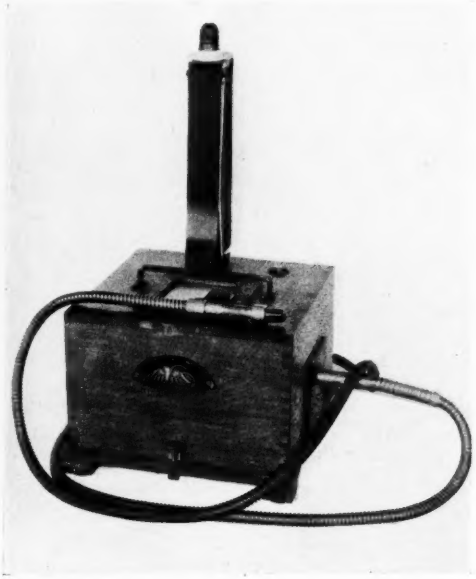

Fig. 3. The Friedrich Iontoquantimeter. This shows the small horn chamber connected by a long wire to the electrometer. The light above the scale is adjusted to avoid parallax.

The essence of radiation is to apply the dose necessary to the tumor and at the same time to radiate normal tissues as little as possible. The greater penetration of short wave lengths in combination with the absence of physical discomfort to the patient permits of using small fields, and cross-firing. For example, a twenty by twenty centimeter field ten centimeters deep radiates four thousand cubic centimeters of tissue. Using two portals of seven by seven centimeters, one has nine hundred and eighty cubic centimeters of body tissue radiated, less than one-quarter of the first amount and yet in a plane seven by seven centimeters large, as large as any radiable lesion; yet the dosage in the depth at the point desired is nearly twice as great.

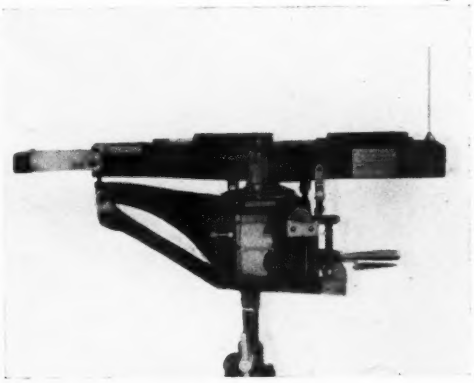

Fig. 4. The Seemann Spectrograph. The rock salt crystal is placed in the end of the instrument, at the left; the films are inserted in the movable carriage.

DOSAGE

As the intensity and penetration of the X-radiation is increased dosage measurements must become more and more accurate. We venture to predict that spark-gap estimation and energy-input valuation will become obsolete. Transformers of different makes and even of the same manufacture vary enormously in output, due probably to difference in wave-form; X-ray tubes differ according to their gaseous content and also according to the condition of the target. The commonly accepted conception that identical radiation is yielded by tubes running at the same voltage, milliamperage, filtration and focal skin distance is only borne out in the use of new tubes with high vacuum and unpitted target functioning with constant-potential continuous-current machines. So many variables necessitate measuring the output of the tube instead of the amount of current going into it. To do this we must put our measuring device in the path of the emerging X-ray beam.

Electroscopes for measuring any X-ray beam have to be of a special construction.

One of the most practical is the Friedrich iontoquantimeter (Fig. 3). This is a small horn chamber, about the size of one's finger, containing the air to be ionized. At the base of the chamber is a graphite rod

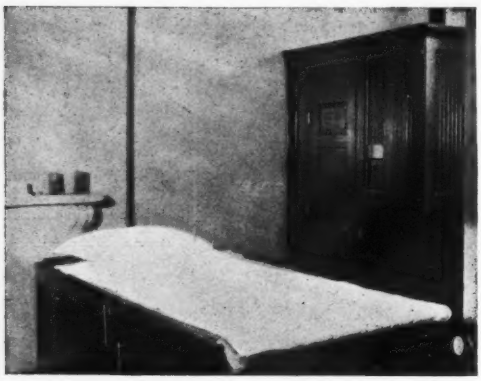

Fig. 5. The treatment room, with the new high-intensity machine. It contains only the treatment table and the operator's room. The tube is in a fixed position inside of leaded table. A plumb-line is used in centering the target. There is no electrical danger as all the machinery is in the basement.

set into an insulating amber collar connected by an insulated wire several feet long to the electrometer. The latter contains a scale and two diverging aluminum leaves. The iontoquantimeter must be carefully grounded, and, also, readings are not accurate unless the machine is thoroughly charged before readings are commenced.

In using this instrument, the horn chamber is placed in the center of the X-ray beam and can be employed during treatments. We can accurately determine the erythema dose with this instrument by direct comparison with an X-ray apparatus whose erythema dose is known or by comparison with the erythema dose of a large amount of radium.[3] Depth dosage can also be ascertained by placing the horn chamber in a body cavity such as the vagina or rectum, during treatments, or by measurements through materials of the density of human tissue, such as water or wax.

[3]GLASSER, OTTO: Eichung des Friedrichschen Iontoquantimeters mit Radium. Fortschritte auf dem Gebiete der Röntgenstrahlen, Bd. XXXII, H. 3/4, 1924.

Thus we have the two essentials—the erythema dose of the skin and the percentage of the erythema dose reached at different levels in the depths. With this knowledge, we can cross-fire on a growth through many portals without burning the skin while giving any desired dosage into the tumor itself.

Fig. 6. The Dessauer Electroscope. Water phantoms and different filters can be interposed between the X-ray target and this electroscope. The instrument is of value in determining the absorption coefficient of the materials interposed.

Another instrument—the Seemann Spectrograph (Fig. 4)—promises with further development to aid materially in determining accurate dosage.[4] Lauer and Bragg opened up this most interesting method of studying X-rays. The X-ray spectrum is comparable to the ordinary light spectrum and is obtained by deflecting the rays from the surface of a rock salt crystal, the angle of deflection varying with the wave length. From a study of the photographic films obtained we can determine the minimum wave length, or, in other words, the peak voltage, to within an accuracy of about 5 per cent. The method is valuable in giving each operator a correct appreciation of his own apparatus. Peak voltage means very little, as the short wave lengths may be in such small quantity as to be negligible. Also average voltage—sometimes

[4]GLASSER, OTTO: The Seemann Spectrograph. Radiology, Vol. III, No. 3, September, 1924.

called effective voltage—is misleading. By means of the spectrograph the approach to homogeneity and, therefore, to exponential absorption is readily seen and easily interpreted.

PRECAUTIONS

With an X-ray machine of such high power, electrical danger can best be averted by placing all the high tension machinery below ground (Fig. 2). This is a very necessary precaution. In our own installation the treatment room (Fig. 5) contains only the treatment table and the operator's room. The X-ray tube is fixed beneath the table; the treatment table is encased in lead a quarter-inch thick, as is the operator's room. All the high tension wires, the transformers, and the various switches and controls are in the room below. We use an overhead plumb line in centering our target, and find accurate positions easier to obtain than with an overhead apparatus.

POSSIBILITIES OF THE NEW APPARATUS

Employment of X-radiations of greater intensity and smaller wave length unquestionably offers new hope in the successful treatment of deep-seated malignancies. There are some drawbacks: a machine of this power needs much careful attention and pampering—the fuses, surge lamps, solenoids and water system have to be constantly watched. Also greater care must be exercised in the selection of portals, so that no overlapping occurs, and over-dosage must be guarded against.

X-rays delivered by tubes running at two hundred thousand volts and five milliamperes have proven helpful in the treatment of uterine fibroids, sarcomata, tuberculous adenopathies, infected tonsils, tuberculous salpingitis and peritonitis, etc. Deep-seated epitheliomata have not responded as well, however, as to radium. With early operable cancer of the cervix, for example, in a large series of cases, radium has effected 50 per cent of cures for over seven years.[5] To date, however, no cured cases of cancer of the cervix have been reported, to my knowledge, using X-ray alone. A combination of radium, applied topically, and high-intensity X-ray, covering the lymphatic drainage areas, may prove more beneficial and yield a higher percentage of cures than either agent used alone, not only in carcinoma of the cervix but in all deep situated epitheliomata.

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[5] BURNAM, CURTIS F.: Results of Treatment of Carcinoma of the Cervix, with Statistics and Technic. Am. Jour. Roentgenol. and Rad. Ther., Nov., 1922, p. 765.

A case of lymphosarcoma.—The new intensive deep-seated irradiation of the lymph-node tumors in a case of generalized lymphosarcoma in a patient dying ten days after the last treatment, resulted in a marked degeneration and necrosis of the atypical lymphoid tissue of the neoplastic nodes, with a flooding of the circulation with the products of such nuclear destruction, and the phagocytosis of the chromatin detritus in the circulation by the reticulo-endothelial cells of the body, especially the Kupffer cells of the liver. The phagocytosis of nuclear material was as marked as the phagocytosis of blood pigment by these cells in severe hemolytic conditions.

In the intensive treatment of leukemia, aleukemic or leukemic lymphosarcomas, large amounts of the products of nuclear destruction are set free into the circulation. What relation this bears to the toxic condition developing after such irradiation remains to be determined.

J. D. CAMP, M.D.

The Phagocytosis of Nuclear Material (Chromatin) by the Reticulo-endothelial System, the Kupffer Cells in Particular, after Intensive Roentgen Irradiation in a Case of Primary Abdominal Lymphosarcoma. A. S. Warthin and J. T. Case. Am. Jour. Roentgenol. and Rad. Ther., Aug., 1924, p. 102.

ADVANCED TROUBLE SHOOTING[1]

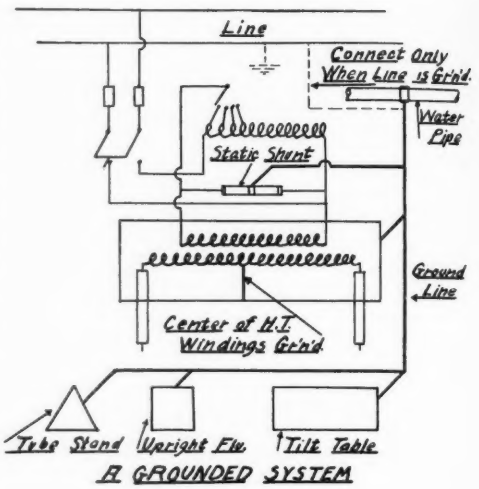
STATIC

By C. B. HORSLEY, PITTSBURGH, PENNA.

STATIC—about which much is said and very little is, as a rule, understood. When meters burn out or tubes puncture, or the patient is "shocked," the trouble is generally, and often correctly, diagnosed as static, but even after the trouble has been correctly classified, most roentgenologists seem to be at a loss as to what steps should be taken to correct it. To the minds of most doctors the word "static" would suggest the word "ground," but too often the object of grounding a piece of apparatus and the principles involved are imperfectly understood.

The primary reason for grounding the various pieces of X-ray apparatus is the protection of the operator and the patient. For instance, should the masts of a tilt table "break down" while the frame of the table is grounded, the greatest trouble is likely to be the burning out of a fuse or the opening of a circuit breaker. If, however, the frame were not grounded and the patient or operator stood in the path between it and some grounded conductor, his body would complete the circuit and thereby receive a severe shock. The second reason for grounding all parts of the apparatus and also for the use of static shunts is in order to dissipate static electricity as it is accumulated.

Take, for example, a dam in a small mountain stream. As long as there is a large outlet at the bottom there is no pressure against the dam. The smaller this outlet is made the higher the pressure will rise until, if there is a weak spot in the dam, it breaks. To a certain extent this is similar to the conditions that arise when a conductor is placed in an electro-static field. If the resistance to the ground is very low there is little chance for the amount of the static electricity to become large enough to do



A GROUNDED SYSTEM

any damage, but as the resistance increases the charge on the conductor increases, up to certain limits. That is to say that, especially in the vicinity of deep therapy apparatus and where trouble with static has been experienced, this trouble can be reduced by using large wire in the grounding circuit, making electrically secure joints, and attaching the ground clamps securely to the water pipe as close as possible to where this pipe enters the building. If one of the service wires is grounded, this should also be used.

The use of static shunts to protect the wiring of the apparatus and the instruments from damage due to static electricity is now a standard practice. The shunts are of a comparatively high resistance in order that no appreciable amount of the 110 or 220 volt circuit can leak to the ground, but are of low enough resistance to dissipate the static that is accumulated before it might attain any harmful proportions.

It should be remembered that any conductor that is surrounded by a grounded conductor cannot be appreciably affected by

[1]This is the fourth of the series of papers by Mr. C. B. Horsley, the first having been published in *Radiology* for November, 1924.

any electrostatic field from the outside. It is for this reason that a grounded copper braid is now being extensively used as the outside covering for all cables connected with X-ray apparatus.

The potential of ground is taken as zero and the object in grounding is to bring all conducting parts of a system as near to the same potential as possible. In a system, however, which is 100,000 volts above ground it is sometimes necessary to "ground" parts together. A deep therapy installation which was brought to my attention not long ago illustrated this point nicely. The milliammeters that were in use were of the type having the entire face made of glass, and the aerial was arranged so that the aerial of opposite polarity passed several feet in front of these meters. The air was particularly hot and dry. It was found that when potentials approaching 200,000 volts were used, a noticeable charge was induced on the glass faces of these meters. These charges produced a field of force between the front and the back of each meter which exerted a dampening effect on the pointer to such an extent that it required upwards of half an hour from the time the current was turned off before the pointer returned to zero. This trouble was remedied by coating the face of the glass with lead foil, leaving only enough open space for the scale to be read, and "grounding" the foil to the metal case of the meter.

Cancer therapy.—To discuss high voltage X-rays as a panacea for cancer is to name only one of the agents used in treating cancer, just as salvarsan is one of the agents in treating syphilis. A judicious combination of surgery, X-rays, radium and electric destruction is the best rule in treating cancer to-day. Just as Dessauer has shown that homogeneous radiation is necessary for the best results in deep-seated lesions, we know that short wave lengths will produce this homogeneous radiation best, and to secure short wave lengths, we must have high voltage.

Before the advent of high voltage treatment, the cardinal points in X-ray treatment were: (1) the quality of rays emitted; (2) the quantity of rays emitted; (3) the time of exposure to the rays; (4) the distance of tube from the part; (5) the amount of filtration; (6) the size and number of ports of entry. These are still the cardinal points and demand even closer attention when using high voltage, than formerly. The problem of dosage is still in the process of development, the delicate instruments now in use being impractical in the hands of many roentgenologists. There are also still unsettled questions in the biological, anatomical and physiological fields which play an important part in determining dosage. Never before in X-ray therapy was it so essential that it be realized that we are treating a patient sick with cancer, and to remember always that the normal tissue cells are susceptible to injury.

While the results from high voltage therapy are very encouraging, we must be better acquainted with the late local effects and the effects upon the body tissues in general before broadcasting high voltage radiation. A conservative co-operation between surgeon, family physician and radiologist is the proper position for the present.

W. W. WATKINS, M.D.

High Voltage X-rays in Cancer. John F. McCullough. Atlantic Med. Jour., May, 1924, p. 469.

RECENT ROENTGENOGRAPHIC FINDINGS IN CASES OF SEVERE GUN-SHOT WOUNDS RECEIVED DURING THE WORLD WAR[1]

By W. I. LeFEVRE, M.D., Cleveland, Ohio

WAR wounds differ fundamentally from wounds observed in civil life. This is due largely to the nature of the destructive force producing the injury. Consequently the sequelæ from such injuries are of more historical than of practical interest, although the experience

Fig. 2. Case I.

Fig. 1. Case I.

Fig. 3. Case VII.

gained in the treatment of such a vast number of these cases, together with the observed fact that these retained foreign bodies in the tissues are harmless unless they interfere with the function of the part, will prove valuable to the civilian practitioner. Volumes have been written on war surgery, and the United States Government has in preparation a Medical History of the World War, to be issued in fifteen large volumes, the first of which is now available.

War wounds are divided into the following five classes:

1. Non-penetrating, which may produce superficial or deep contusions.
2. Penetrating, where the missile does not emerge.
3. Perforating, the missile passing through.
4. Disruptive, resulting from concussion of high explosive shells.
5. Incised, from a cut or bayonet wound.

Of these, the penetrating wound is of most interest roentgenographically, as the retained missile can be observed. In the contused wound, or the perforating wound, only when the bony structure has been involved, are they discernible. The disruptive or incised wounds are not of interest. The statement is made that penetrating wounds formed a large percentage of those sustained in the late war; however, statistics covering this field are not as yet obtainable.

The cases I will show you have been observed in the U. S. Veterans' Bureau in Cleveland during the past two and a half years. During this time 20,000 cases have been examined, of which 2,600 have been radiographed. Of these, approximately 350 have been due to gun-shot wounds.

The illustrations have been selected from a point of interest, and with a view to variety. We might term these cases the "end-results observed in severe war wounds," as

[1] Read before the Radiological Society of North America, at Rochester, Minnesota, December, 1923.

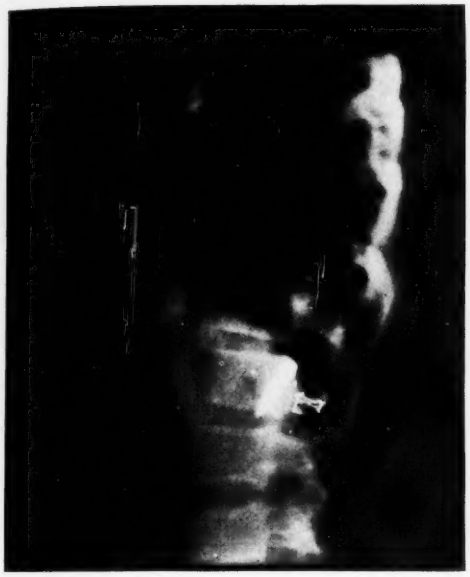


Fig. 4. Case VII.

they had survived the injury, from a minimum of about three years to a maximum of about five years, when these observations were made. To the best of my knowledge all are now alive, and it is surprising to see what splendid recoveries some have made. The Bureau rates their disability on a percentage basis, 100 per cent being total, so this rating gives you some idea of the condition of each individual.

In conclusion, I feel sure that you will concur with me in the hope that radiographs depicting such injuries may find a permanent resting place in some suitable depository, like the Medical Museum at Washington, where they may be real curiosities to the generations to come—that war with all its horrors may be effaced from the earth and peace and good-will prevail.

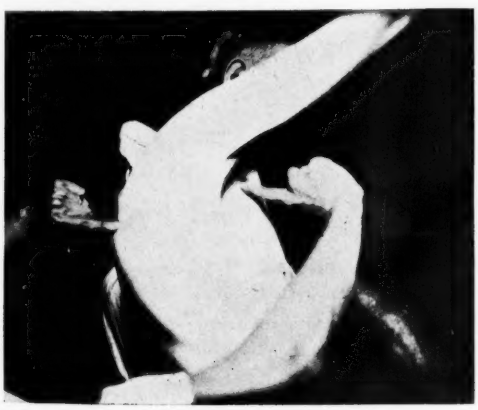


Fig. 5. Case VII.

Fig. 6. Case VIII.

DETAILS OF CASES

Case I (Figs. 1 and 2). R. O. Struck by piece of shell casing in right eye, fragment passing through eye-ball and posterior inner portion of bony orbit, lodging in sphenoid bone just left of center line. About four-fifths of fragment imbedded in bone and rest protruding upward under brain, probably not penetrating brain substance. Left eyesight not impaired. Physical recovery good. Patient suffers some mental disturbance, complains of head pains and is irritable. Wears glass right eye and cosmetic result good. Injured in 1918.

Case II. B. D. S. Double comminuted, compressed fracture of the left side of

Fig. 7. Case X.

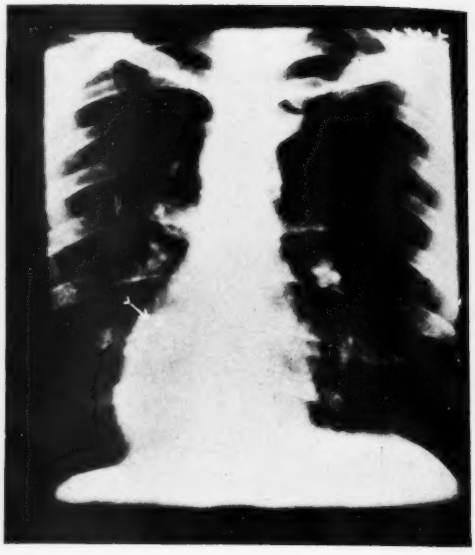


Fig. 8. Case XI.

head, affecting both frontal and parietal bones. Patient unconscious for six months and paralyzed on right side for eleven months following injury. Operated on in base hospital in France. Second operation in United States, two and a half years later, when sections of bone were removed. Has healed with some depression of scalp over area of removal. Patient recovered physically, but suffers with epileptic attacks.

Case III. C. H. Had perforating bullet wound in the face, missile passing through right cheek, lower jaw, through floor of mouth, and out left side between lower and upper maxillæ. The right lower mandible suffered a comminuted fracture with loss of bicuspids and molar teeth. The fragments were wired and wires left *in situ*. Bone graft in ascending ramus of this side. Patient has some numbness of right side of face and tongue, with severe scarring on both sides of face, with slight difficulty of speech.

Case IV. F. L. In aeroplane crash, suffered compound fracture of the right femur, fracture of the patella and clavicle. Leg became infected; with non-union. Eventually had union after bone graft in femur, graft taken from tibia. Injured leg one inch shorter than other.

Case V. C. B. Injured in April, 1922, by flying shrapnel. Numerous small pieces of shrapnel scattered throughout the muscles of thigh. Femur not injured. Fragments left *in situ*. No disability resulting. Leg has good function.

Case VI. L. K. Sustained bruise of left elbow when boat was torpedoed, May 18, 1918. Injury did not cause serious symptoms until after discharge from the service. Operated on twice during 1921, following pain and swelling over elbow region. Had sinus, with discharge. Radiographs show partial destruction of lower end of radius, appearance of an old osteomyelitis.

Case VII (Figs. 3, 4 and 5). A. R. Has machine gun bullet in left side, just beneath eleventh rib, back of mid-axillary line. Bullet entered on right side. Patient has scars both in front and back of axilla (See Fig. 5, fingers point to scars), appearance of perforating wounds. Possibly one bullet perforated and another went through

chest from right side to present position on left side. Patient has no scar on left side at any point. Bullet not causing any symptoms.

Fig. 9. Case XI.

Case VIII (Fig. 6). Patient has machine gun bullet in anterior abdominal wall, just over left pubic bone. Bullet entered in back, near crest of left ilium and penetrated through pelvis, without injuring the bony structure. Patient has made a good recovery.

Case IX. Severe gun-shot wound to the left shoulder region. Radiograph shows partial destruction of the glenoid cavity, the inner half of head of humerus destroyed, long oblique fracture of the neck of the humerus, which has united, puncture

Fig. 10. Case XI.

through scapula near center of wing, and deep corrugations along inner border. Patient can raise arm to a right angle, with partial use of the same.

Case X (Fig. 7). Patient suffered penetrating shrapnel wound to right buttock, with injury to the posterior surface of the body of the ischium, with large callus exudate resulting. Large piece of shrapnel remaining in soft tissues.

Case XI (Figs. 8, 9 and 10). Patient wounded by shrapnel in left anterior chest in June, 1918. Small piece penetrated chest wall and lodged in anterior portion of heart structure. Scar on chest due to infection of wound and not to direct injury. Recovery complete.

The singing voice. — The character of the voice is related to sex virility, and removal of the testicles or ovaries materially alters the human voice. Conversely a stimulating dose of radiation applied to the ovaries and possibly other endocrine glands has, in several cases, noticeably altered the quality and volume of the singing voice. This has been observed in five successive cases of the author.

W. W. WATKINS, M.D.

Endocrine Radiation as a Means of Improving the Quality and Power of the Singing Voice. H. H. Rubin. Virginia Med. Monthly, July 1924, p. 241.

IDIOPATHIC EVENTRATION OF THE DIAPHRAGM[1]

By MORRIS I. BIERMAN, B.S., M.D., WASHINGTON, D. C.

TO one who makes an intensive study of any portion of the body will quickly come the realization that physical development is not as constant or as symmetrical as is generally supposed. Usually the departures in development from what is considered to be normal are slight, but at times the embryological maldevelopment may be so great as to threaten, or even preclude, the existence of the individual. The development of the body is accurate in its gross aspects, but in its minutiæ there is constant failure of repetition.

One of these abnormalities of development is eventration of the diaphragm, and the condition may be defined as an idiopathic lesion in which one-half of the diaphragm becomes greatly relaxed, so that the abdominal organs encroach upon the thoracic cavity. The diaphragm is thin and fibrotic; there is no degeneration of the corresponding phrenic nerve.

The history of this condition dates back to the time of Petit (1790) and Cruveilhier (1829), who applied the general term "eventration" to all abdominal hernias, and regarded the diaphragm as subject to the same influences, which result in thinning and relaxation of the anterior abdominal wall. As applied to the diaphragm, the condition has been termed "eventration of the diaphragm." But however incorrect may have been its original interpretation, the term "eventration of the diaphragm" has come to be generally accepted, especially in this country.

The clinical recognition of eventration is usually a most difficult task. As a matter of fact, previous to the time when aid could be given by radiographic examination the diagnosis had never been made at all during life. The difficulties of interpretation of the confusing physical signs, combined with the great rarity of the lesion, make the diagnosis almost impossible without the aid of the X-ray.

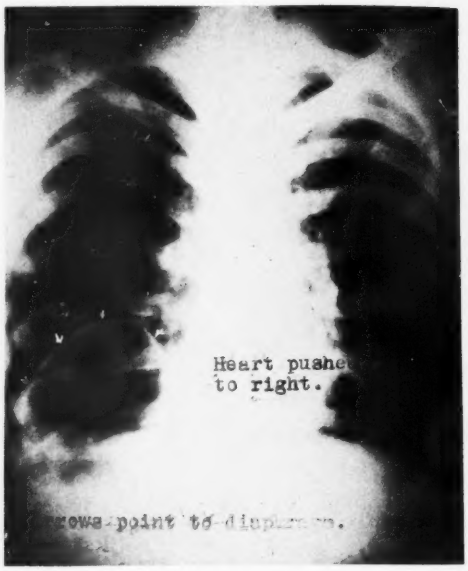


Fig. 1. Heart displaced toward the right by eventrated diaphragm. Arrows point to diaphragm.

The physical signs depend in a great measure upon the degree of eventration, the state of fullness of the stomach and intestines, and the side on which the lesion occurs. In left-sided eventration the usual physical signs are diminished expansion of the left thorax and absence of Litten's sign. At the left base the respiratory murmur is replaced by splashing and metallic sounds when the stomach and intestines contain food or fluids. When they are empty the left base gives a tympanitic note, absence of voice and breath sounds, and absence of vocal fremitus. The heart is usually displaced toward the side opposite the lesion. In fact, dextro-cardia is one of the most important indications of an abnormality of the diaphragm.

In right-sided eventration the physical signs are modified by the presence of the

[1] Read before the Medical Society of the District of Columbia, Washington, D. C., May 21, 1924.

liver, and whether or not stomach and bowel come to lie between the liver and diaphragm.

The postmortem examinations which have been made have revealed a fairly uniform picture. The lung is small and hypoplastic, but atelectasis has never been ob-

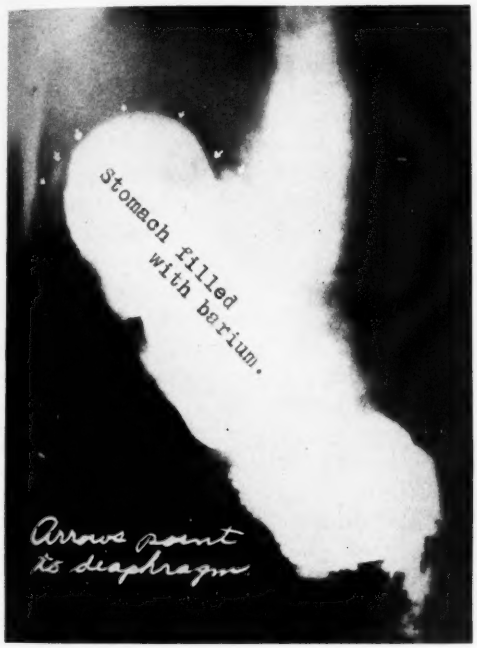


Fig. 2. Showing position of upper pole of stomach to be thoracic yet sub-diaphragmatic.

served. The diaphragm is a thin, translucent membrane, containing a few muscle bundles, and smoothly covered by pleura and peritoneum. The phrenic nerve has occasionally been found somewhat reduced in size, but otherwise normal. The stomach is situated high up under the diaphragmatic vault; its position is thoracic yet subdiaphragmatic. In close association with the stomach are the small intestines, the splenic flexure, the spleen and omentum.

The history of the case here reported is as follows:

Male, white, age 33, occupation, shoe clerk. Family history negative as to hereditary disease. Past history showed measles and scarlet fever during childhood and otitis media at the age of ten, with complete recovery. Influenza in 1918, without complications. *Present illness:* The symptoms which caused him to seek medical advice were occasional paroxysms of coughing, lasting a minute or two, coming on at intervals several times a day. This had been going on for about two weeks. In addition to these symptoms he had a faint yet definite feeling of heaviness in the cardiac region after eating, especially following heavy meals. Physical examination was negative with the exception of slight limitation of motion of the lower left thorax. The heart was apparently normal, although the apex impulse appeared to be somewhat medial to its normal position.

X-ray examination was advised, and the radiogram showed that the left leaf of the diaphragm had so far relaxed that its upper border was on a level with the fourth rib, anteriorly. As a result of this encroachment upon the thoracic cavity, the heart had been displaced to the right. On fluoroscopic examination the left diaphragm at first appeared to be immobile, but on forced respiration there was an excursion of somewhat less than half an inch, descending with inspiration and rising with expiration, the normal movements. The right diaphragm moved freely and well, by contrast even appearing to compensate for the diminished excursion of the left side. The cardiac action was normal.

In order to rule out a possible hernia with protrusion of the upper gastric pole through a defect in the diaphragm, a barium meal was given. The gastric shadow showed that the entire stomach was below the diaphragm, and the diaphragmatic attachments both medially and laterally were unusually clear. The stomach was in close association with a light mottled area due to coils of small intestine and splenic flexure. On account of the upward displacement of the stomach, the duodenum had been pulled over to the left half of the abdomen and was situated behind the distal portion of the stomach.

Examination three months later showed the conditions to be the same.

Many theories have been advanced as to the etiology of this remarkable condition. There are those who include it among the forms of diaphragmatic hernia, regarding the distended diaphragm, reaching high into the thorax, as the hernial sac.

Another attempt at explanation has been made through the hypoplasia of the lung, which is constantly present. It is held that the congenital hypoplasia, plus the upward suction of the negative intrathoracic pressure, results in thinning of the diaphragm and upward displacement of the abdominal contents.

Another theory maintains that there is a congenital deficiency of the muscular tissue of the affected leaflet of the diaphragm, and as a result the weak diaphragm fails to expand the lung and assumes a high position, dragging the viscera with it.

The hypothesis that dextro-cardia is an etiological factor finds but little supporting evidence.

Those advocating an acquired nerve lesion as the etiological factor forget that a nerve lesion immediately excludes the condition from the category of "idiopathic" eventration.

Each of these theories has its value and some supporting evidence, but none of them can completely explain such a complex situation. It is conceivable that the tendency to equalization of the thoracic negative pressure and the abdominal positive pressure, combined with hypoplasia of one lung and faulty development of one side of the diaphragm, a rare combination of circumstances, may result in an equally rare condition such as the one under consideration. But even this rare combination of circumstances cannot entirely account for eventration in the newborn, which has been observed at several postmortem examinations. It is quite evident, therefore, that further study is essential to the recognition of the etiological factors of this unusual condition.

Certain pathological conditions simulate eventration of the diaphragm and these must be ruled out before a final diagnosis is made. Paralysis of the diaphragm, with loss of tone and the resultant high position cannot be interpreted as eventration. Such cases as this are for the most part fatal, or, if they improve, they do so so rapidly that the clinical picture of eventration with its attendant symptoms does not become a part of the disease complex. For instance, in progressive muscular atrophy the condition of the diaphragm may resemble that frequently seen in cases of eventration, but the lesion is quite obviously a part of a general disease.

Other lesions of the phrenic nerve, such as peripheral neuritis following diphtheria, and toxic conditions following alcoholism, beri-beri, etc., have at times produced paralysis of the diaphragm and consequent high position, with the clinical and anatomical picture of eventration. However, in these cases when the general condition and nerve lesion improved, the normal tone and position of the diaphragm have been regained. In those severe lesions which resulted fatally and in which postmortem examination was made, the flaccid fibrosis which is characteristic of eventration of the diaphragm was not found to be present.

Radiotherapy and surgery.—In this type of lesion no other method has given the authors such encouraging results as has cross-fire preoperative radiation with a short wave length roentgen ray, followed about three weeks later by surgical exenteration, preferably with the cautery, and then post-operative radiation. Radium needles or emanation are used as well, if indicated. Sarcoma seems to be more amenable to this treatment than carcinoma. The possible results of radiation upon the eye and pituitary should be considered, and the eyes and sella turcica should be protected from direct rays.

J. D. CAMP, M.D.

Roentgen Therapy of Sinus and Intracranial Newgrowths. L. A. Smith. Am. Jour. Roentgenol. and Rad. Ther., Aug., 1924, p. 138.

THE TREATMENT OF MALIGNANCY OF THE EYEBALL[1]

By G. W. GRIER, M.D., Pittsburgh, Pa.

AS A basis for the consideration of radiotherapy in the treatment of malignant tumors of the eye, these may be conveniently divided into two groups: First, epibulbar tumors, or those occurring on the ocular conjunctiva; second, intra-ocular tumors. While this classification is not entirely accurate anatomically, it serves to distinguish two groups of lesions which are treated in an entirely different manner. Those of the first group are superficial and have little tendency to penetrate into the globe, or to metastasize. They occur in a conspicuous location and are consequently recognized early by the patient or those around him, and for that reason he usually applies early for treatment. Their superficial location makes the application of radiation comparatively simple and effective. Lesions in the second group grow rapidly, often penetrate the coats of the eye and involve the orbital tissues, and are prone to metastasize. They are often of large size before they are discovered and their deep location and the involvement of surrounding tissues make them much less susceptible to radiation.

Epibulbar tumors: These lesions may occur anywhere on the ocular conjunctiva. In most of my cases they have been situated just at the corneo-scleral margin. They begin as small elevated lesions, with dilated blood vessels radiating from them. Epitheliomata are pearly white in color; melano-sarcomata have dark brown streaks running through them. In later stages the epitheliomata have the typical cauliflower appearance seen in other locations. Small-celled sarcomata and lympho-sarcomata are more or less globular and the external surface is smooth. The diagnosis is, of course, only definitely established by section. I have treated 7 cases of epithelioma, 2 of melano-sarcoma, 1 of small-cell sarcoma and 1 lympho-sarcoma. The last-mentioned case, while not proven by section, seemed reasonably certain of diagnosis. This patient was first seen in the fall of 1918 with a lump in the upper lid near the external canthus and in the region of the lachrymal gland. I referred her to Dr. E. B. Heckel, who removed as much of this lump as possible, and on section it proved to be lympho-sarcoma. This tumor recurred in 1919 and was treated by X-ray, when it completely disappeared and has not returned since. In April, 1923, she returned with a large globular tumor in or under the conjunctiva and occupying all of the outer half of the visible portion of the globe. This recurrence in the eyeball was not sectioned, but under X-ray treatment it entirely disappeared and has remained well since. While the diagnosis is not proven in this case, the previous existence of lympho-sarcoma in the immediate neighborhood seems sufficiently significant.

These cases were all treated in a similar manner, with one exception. This patient had a sarcoma as large as a hickory nut which protruded from the front of the eyeball and, of course, prevented the closing of the eyelids. As he lived in a remote district and the chances of his returning for treatment were problematical, I gave him a massive dose of unfiltered radiation consisting of 15 minutes at 10-inch distance, 5 milliamperes and 7-inch back-up, the rays, of course, being strictly confined to the tumor. A month or so later the patient wrote to say that the tumor had about disappeared, but we never heard from him afterward.

The remaining ten cases were treated with an entirely different technic and with such satisfactory results that I feel justified in explaining this technic in detail. All of these cases are now well and have been so for the following periods: One case for 6 months, one case for 1½ years, one case for 2 years, two cases for 3 years, one case for 4 years, two cases for 5 years, one case

[1]Read before the Radiological Society of North America, at Kansas City, December, 1924.

for 6 years, one case for 7 years. The technic employed consists in the administration of totally unfiltered X-rays of a penetration corresponding to a 7-inch parallel spark gap. Before applying the rays, the eye is cocainized with two or three

Fig. 1. Lympho-sarcoma, left eyeball, now well for one and one-half years.

drops of a 4 per cent solution of cocaine. This allows the patient to open the eye wider so as to expose the lesion better and to fix the eye on a given point without winking too much. It also makes it easier to apply instruments to hold back the lid, if these are necessary. A tinfoil mask is prepared, with an aperture cut to match the lesion, and this is held in place by a bandage, or other suitable means. The rays are applied for 3½ minutes at a sitting, using 5 milliamperes at 10-inch distance. This treatment is repeated every other day until four treatments have been given, and the patient is then rested for three or four weeks. This series of treatments is a little more than an erythema dose. It may give the patient a little discomfort and perhaps a slight conjunctivitis, but no untoward effects have ever resulted. At the end of

Fig. 2. Epithelioma on the right eyeball, now well for five and one-half years.

four weeks, if any of the lesion remains, the series is repeated and another period of rest instituted. This procedure is repeated as often as is necessary to cause the complete disappearance of the lesion. Of the ten cases which I have treated in this manner, three had one series, two had two series, two had three, one had four, one had five and one had six. The final result is a very slight or almost imperceptible scar.

I realize that this technic is absolutely different from the massive "knock-out" dose which I have always advocated so strongly for superficial malignancy. Such a dose is naturally followed by a more or less extensive tissue necrosis, and it seems injudicious to bring about this result in the eyeball. An epithelioma of the face is already an ulcerative lesion and a little extra necrosis as a result of X-ray treatment does no harm, but the lesion on the eyeball is not ulcerative and to make it so is highly unde-

sirable, as an infected ulcer in that location is no trifling matter. It is also to be noted that the treatment described is not the old fractional dose method where small doses were repeated two or three times a week for an indefinite period. By that method, either the cumulative effect of the repeated dosage results eventually in tissue necrosis, or else the effect of the repeated small doses renders the tissues insensitive to radiation, depending upon the dosage employed. Neither of these results obtains from the technic described.

I prefer X-ray to radium for these superficial lesions for the following reasons: It is more easily and accurately applied. A light tinfoil mask protects the surrounding tissues, but heavy lead is necessary to protect them from the gamma rays of radium. If the radium is in metal containers it is particularly unsuitable, as this cuts out many of the soft rays which are desirable for the treatment of surface lesions. The length of the treatment with radium is longer, increasing the patient's discomfort and also increasing the chances of the mask slipping and thus exposing surrounding parts. My experience with the use of X-rays in the treatment of malignancy on the ocular conjunctiva leads me to believe that this is the treatment of choice unless the lesion is so extensive that the loss of the eye is obviously inevitable. If this is manifestly the case, then I believe the procedures advocated below for intra-ocular tumors should be carried out.

Intra-ocular tumors: These may be of any of the various types of sarcoma, metastatic carcinoma, or glioma. The sarcomata may spring from the iris, ciliary body, or choroid, usually the latter. They eventually penetrate the coats of the eye and involve the tissues of the orbit. Metastatic carcinoma is usually a part of a general carcinosis which soon proves fatal, and the treatment of the lesion in the eye is a matter of minor importance. Gliomata spring from the retina, or optic nerve, spread rapidly and soon involve surrounding tissues. The prognosis in any of these tumors is bad, whatever treatment may be carried out. It is doubtful if radiation alone is ever advisable except as a palliative treatment, although there are a few cases of glioma reported in the literature as cured or held in abeyance following this treatment.

If the case is seen before the tumor has broken through the coats of the eye, enucleation followed by vigorous radiation may be successful. However, the frequency with which recurrence in the orbit follows this procedure raises the question as to whether complete exenteration in the beginning is not the better procedure. This should be followed as soon as possible by the introduction of radium into the orbit. For this purpose I use 100 milligrams filtered through 1 millimeter of brass and wrapped in 1/2 inch of gauze and left in place for 10 hours. At the same time full doses of X-rays should be applied all around the orbit, using the modern deep therapy technic if such apparatus is available. Even after such vigorous and radical treatment, the prognosis is doubtful. If recurrence of the local lesion is prevented by this means, the patient often develops metastases in the liver or lungs which prove fatal.

Out of 9 cases of this nature which I have treated, 6 are dead, 2 are under treatment and one is apparently free from disease at this time. Of this series, 7 had the eye removed and 2 did not. One of the latter is the case which is apparently cured (4 years). However, it is questionable whether this case was not an entirely extra-ocular tumor, as the sight was never obscured and the bulk of the tumor was quite plainly in the orbit. Excepting this case and the two still under treatment, the longest period of survival was four years and, curiously enough, this patient was also unoperated upon. However, I feel that until some better method of treatment is discovered the procedure named, that is, exenteration followed by radium in the orbit and deep X-ray therapy on the outside, offers the patient the best chance of recovery.

CASE REPORTS AND NEW DEVICES

A NEW METHOD FOR MAKING RADIOGRAPHS OF THE CERVICAL VERTEBRÆ IN LATERAL POSITION

By C. C. GRANDY, M.D., Fort Wayne, Indiana

We have developed a technic which we think has enough merit to warrant its publication. We have always had trouble radiographing this part of the body, and so, by necessity, we were obliged to take the radiograph that is shown in Figure 1. This man was injured by a fall from a horse, and it was impossible for him to lie down. We then placed him in position as

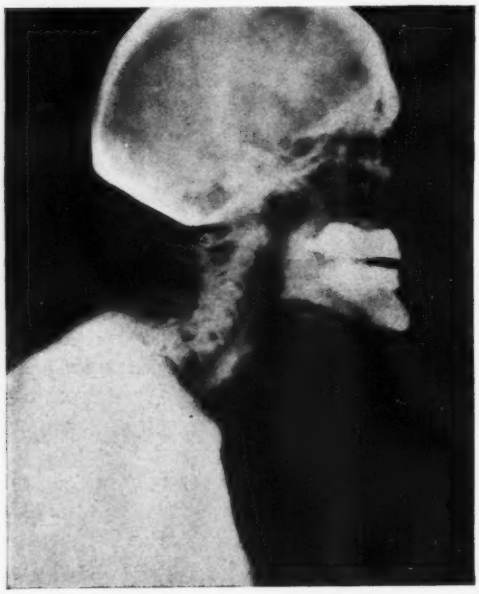


Fig. 1. Showing fracture and dislocation of the sixth on the seventh cervical vertebra.

shown in Figure 2. The point of the shoulder is placed against the cassette, the neck is then about 6 inches away from it. In order to prevent distortion the tube is placed about 6 feet away and on the level with the top of the shoulder. With double screens and super-speed films a good radiograph can be taken with either of the following formulæ: 10 ma., 5 in. gap, 15 secs., or 100 ma., 7 in. gap, 1/2 sec., using a radiator type Coolidge tube. For convenience, we hold the head still by the use of a photographer's head clamp, as shown in Figures 2 and 3, back of the head.

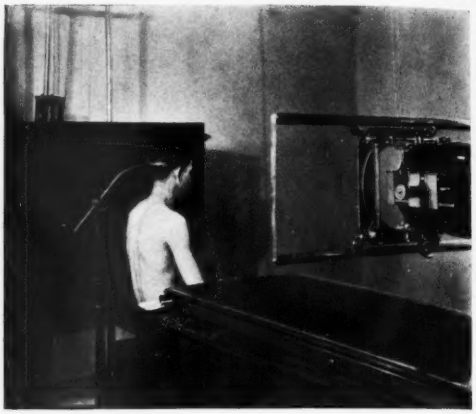


Fig. 2. Showing the relative positions of plate, patient, and tube.

Fig. 3. Showing all the cervical vertebræ and the first dorsal vertebra.

We find that this method gives very clear radiographs of the lower cervical spine with so slight a degree of distortion that they can be easily read, and without any discomfort to the patient. Stereoscopic plates can be taken in the usual manner, and they contain a wealth of information.

This method is also very useful to orthodontists, because, by a shorter exposure, a good profile of the face can be made, showing the outline of the lips with the teeth in position. By this method one is able to determine which teeth are out of alignment and how much improvement has taken place after adjustments.

UNUSUAL POSITION OF AN OPEN SAFETY PIN IN THE ESOPHAGUS [1]

By PORTER P. VINSON, M.D.
Section on Medicine, Mayo Clinic
ROCHESTER, MINNESOTA

Although it is quite common for children to swallow open safety pins, which become impacted in the esophagus, it is very unusual to find the pin pointing down. In 1923 Iglauer [2] observed such a case, and thought that the pin might have passed into the stomach and been regurgitated into the esophagus, although he was not able to elicit a history of vomiting. He said that the patient might have swallowed the pin with the point down, but this would seem improbable. It was also suggested that the pin was closed when it was swallowed, and had later opened in the esophagus.

The case herewith reported illustrates this rather rare position. A baby girl, aged seventeen months, accidentally swallowed an open safety pin, October 12, 1924. Immediately afterward a roentgenogram was made. The mother said that the pin was revealed in the upper portion of the esophagus with the point directed upward. An esophagoscopic examination was made, but the examiner was unable to remove the foreign body. Following the examination,

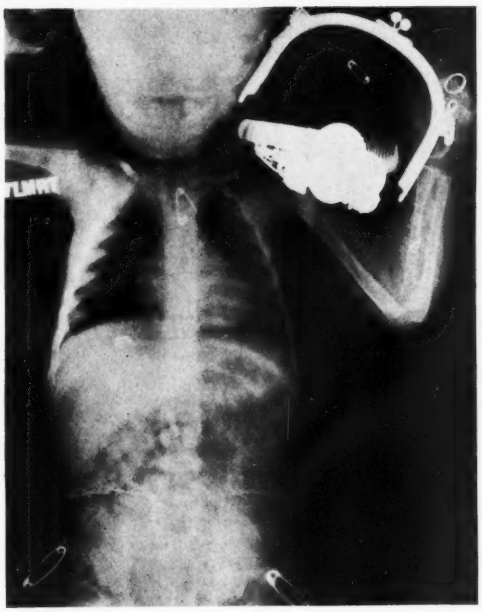


Fig. 1. Open safety pin in the upper third of the esophagus with the point down.

the patient vomited several times. The following day, the child was brought to the Mayo Clinic, and roentgenographic examination revealed the pin in the upper esoph-

Fig. 2. Patient two hours after removal of the safety pin.

[1] Submitted for publication November 13, 1924.
[2] IGLAUER, SAMUEL: X-ray Diagnosis of Unusual Laryngo-tracheal Esophageal Conditions and Diseases. *Am. Jour. Roentgenol. and Radium Therapy*, 1923, VII, 547-550.

agus, with the point directed downward (Fig. 1). October 15 the patient was esophagoscoped without anesthesia, and the pin was removed without difficulty (Fig. 2).

In this case, it seems likely that during the first esophagoscopic examination the pin had passed into the stomach and had been regurgitated into the esophagus during one of the vomiting spells which followed the instrumentation. It is possible, however, that the small size of the pin had permitted it to be rotated during the examination.

CALCIFIED AREAS IN THE ABDOMINAL CAVITY

REPORT OF SIX CASES

By CHARLES G. SUTHERLAND, M.B. (Tor.), Associate in Roentgenology, Mayo Clinic, Rochester, Minnesota

CALCIFICATION OF AN INTRACAPSULAR RENAL HEMATOMA

Case 1 (A126067). A man, aged 59 years, had sustained a severe accident while coasting, thirty years before. Several ribs were fractured, and it was believed that there were abdominal and spinal injuries. There was motor and sensory paralysis for the first three weeks, and loss of sphincteric control of the bladder and rectum for four or five days. He was in bed for three months, and had been able to work only about ten of the thirty years since the accident.

Examination disclosed a large, hard mass in the left upper quadrant, apparently in the kidney. The X-ray (Fig. 1) revealed two stones in the right kidney and a large pear-shaped mass on the left side, from the eleventh rib to the crest of the ilium. Urologic investigation demonstrated that the left kidney was functionless; only a remnant of the pelvis remained, the kidney substance being almost entirely destroyed. A diagnosis was made of an intracapsular renal hematoma with calcification. Myocarditis was causing the patient considerable distress, and this, with the condition of the kidney, contra-indicated surgery.

Fig. 1 (Case A126067). Calcification in an intracapsular renal hematoma.

He returned home, and died seven months later; necropsy was not performed.

POST-TYPHOID ENLARGEMENT OF THE SPLEEN

Case 2 (A198574). A man, aged 50 years, came to the Clinic with Bright's disease and marked edema of the legs. He had had typhoid fever four years before. Enlargement of the spleen had been noted during the attack of typhoid fever; there had been no noticeable change in its size since.

At examination a large mass was palpated in the left abdomen, reaching from the level of the sixth rib anteriorly to the crest of the ilium. The Wassermann blood reaction was negative, and there was nothing in the history to suggest syphilitic infection. X-ray revealed a large calcified area on the left side (Fig. 2), and the urologic investigation proved this to be extrarenal. A clinical diagnosis was made of post-typhoid enlargement of the spleen; surgery was not advised.

POST-TYPHOID LUMBAR ABSCESS

Case 3 (A221665). A man, aged 32 years, had had typhoid fever six months before coming to the Clinic. In the sixth week he had had a severe nasal hemor-

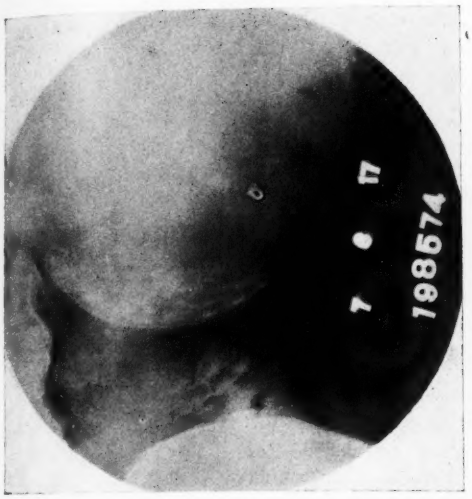


Fig. 2 (Case A198574). Post-typhoid enlargement of the spleen.

rhage, and two days later pain in the left side, with infection that necessitated rib resection and pleural drainage at the end of three weeks. The wound had continued to drain.

Fig. 3 (Case A221665). Post-typhoid lumbar abscess.

X-ray examination disclosed slight fixation of the diaphragm at the costophrenic angle, probably due to adherent pleura. At operation an old encysted empyema with a small cavity, about 7 cm. in diameter, was found, but no extension could be felt or probed.

Nine months later the patient returned and the X-ray (Fig. 3) revealed a large circumscribed calcified area on the left side, extending down to the upper level of the fourth lumbar vertebra. A pyelogram revealed an evident reduplication of the pelvis of the kidney; the area apparently was extrarenal. At operation a large lumbar abscess, 13 cm. in diameter, was opened, and communication with the empyema sinus demonstrated. The abscess was successfully drained, and subsequent inquiries show that recovery has been complete.

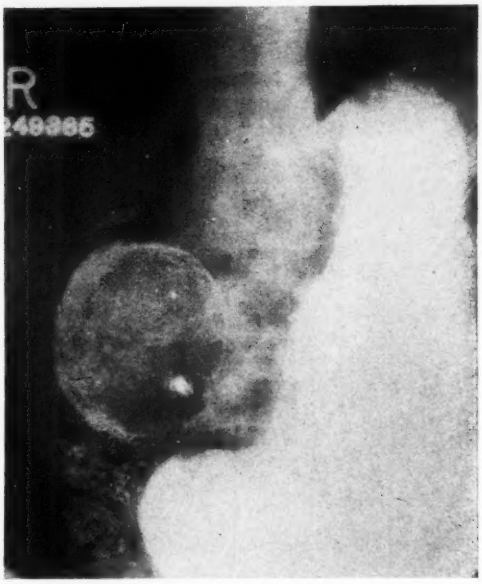


Fig. 4 (Case A249365). Caseating, calcareous tumor beneath the head of the pancreas.

CASEATING CALCAREOUS TUMOR BENEATH THE HEAD OF THE PANCREAS

Case 4 (A249365). A man, aged 51 years, had been injured twenty-five years before, by a log striking his back. He was confined to bed for four weeks, but had no symptoms suggesting traumatic myelitis. He had had "indigestion" for thirty years, with a tendency to slight diarrhea until

two years before, when he became constipated.

Examination revealed a hard, rather fixed tumor on the right side just under the cartilages of the eighth and ninth ribs. Peristalsis in the stomach was visible. X-ray examination disclosed retention of three-

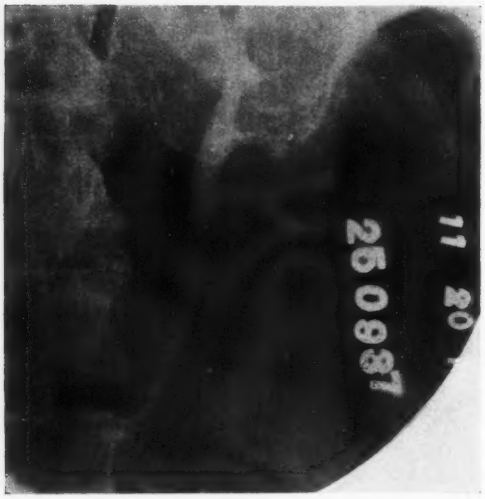


Fig. 5 (Case A250937). Pancreatic cyst in upper left quadrant.

fourths of the six-hour meal, an enlarged stomach and a cystic tumor (Fig. 4) lying to the right of the third and fourth lumbar vertebræ. At operation a caseating, calcareous tumor, 8 cm. in diameter, was found beneath the head of the pancreas. The mass was firmly attached to the spine along the venæ cavæ, and to the head of the pancreas; therefore it could not be removed. The tumor, encapsulated in a hard shell, was apparently an old one, and was not causing trouble from pressure. It could not be determined definitely whether the tumor was an enlarged, caseating, calcareous gland or a calcified tumor in the head of the pancreas. The patient also had a perforating duodenal ulcer. Subsequent letters show that his condition is greatly improved, and that there are no symptoms from the tumor.

CALCIFIED CYST IN THE UPPER LEFT QUADRANT

Case 5 (A250937). A man, aged 61 years, came to the Clinic complaining of constipation.

X-ray examination of the colon revealed an encapsulated mass, 9 cm. in diameter, in the left upper quadrant under the eleventh and twelfth ribs. A pyelogram (Fig. 5) demonstrated that the tumor was extrarenal. A clinical diagnosis of pancreatic cyst was made and exploration advised, but the patient refused operation and returned home.

CHRONIC NEPHRITIS WITH CALCIFIED CYSTS OF CORTEX

Case 6 (A254839). A woman, aged 33 years, had had only slight symptoms referable to the kidney. Examination showed that the right kidney was about one and one-half times normal size, and slightly tender on palpation.

X-ray examination (Fig. 6) revealed a calcified area on the right side above the renal area. A pyelogram demonstrated that the tumor was in close relation to the

Fig. 6 (Case A254839). Chronic nephritis with cysts in the cortex, the walls of the cysts being calcified.

kidney, but it could not be determined definitely whether it was intra- or extra-renal. Nephrectomy was performed, and chronic

nephritis and cysts of the cortex partially filled with gelatinous material were found. The kidney weighed 231 gm. Two-fifths of its substance had been destroyed, and the walls of the cysts were undergoing calcareous degeneration.

RADIOGRAPHIC TECHNIC

By R. J. MAIER, B.A., M.D., Post-graduate Hospital and Medical School, CHICAGO, ILLINOIS

It has been the custom of roentgenologists to use their Coolidge tubes as in Figure 1 B, or slightly tilted in the bowl, with the anode higher than the cathode, as in 1 A. It was thought that this gave a more direct ray, hence a better shadow on the film. During some measurements of intensity at different angles from the face of the target, we took occasion to get an exposure or picture of the target itself, using a pinhole through a sheet of lead, with the results shown in Figures 2, 3 and 4.

Figure 2 was taken with the anode and cathode at the same level, showing the focal point during operation. Figure 3 was taken with the anode elevated so that the tube stood at a 20° angle in the bowl. This shows a marked enlargement of the focal point. Figure 4 shows the focal point with the anode depressed so that the rays are taken off the target at 25° instead of 45°. This shows a much smaller focal point, with a more even distribution of intensity.

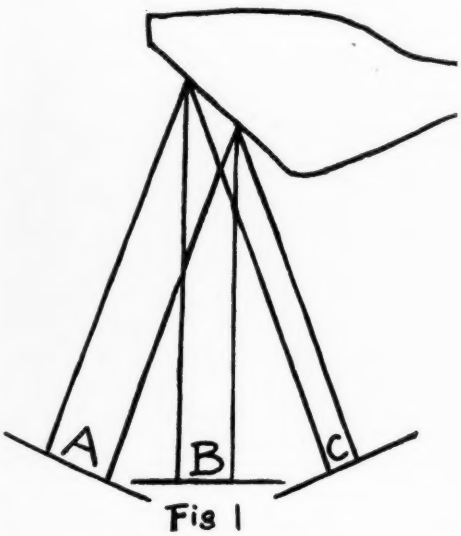


Fig. 1. (B) Tube in horizontal position; (A) Anode higher than cathode; (C) Cathode higher than anode. Rays taken off the target at 25° angle.

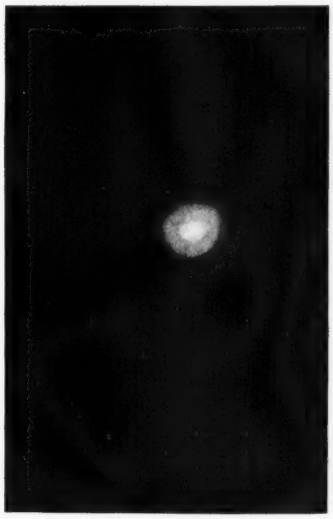


Fig. 2. Anode and cathode at the same level.

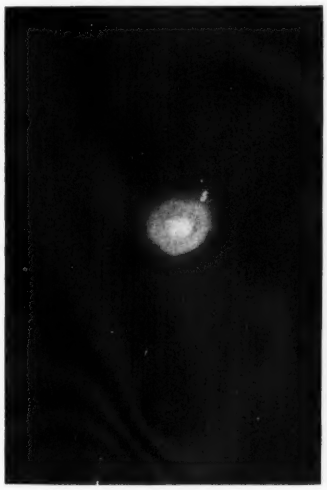


Fig. 3. Anode elevated. Tube at 20° angle.

The above reproductions were obtained using the same tube, with constant milliamperage, spark gap, time, and distance.

As it is well known that fine detail upon the film depends, in a large measure, upon the size of the focal spot, we attempted to prove that this position of the tube would give better detail than other positions, without restricting the field or changing the photographic effect. The results are shown in Figures 5 and 6. Identical technic was used throughout, with a marked difference in detail. This difference was shown most clearly in those wires running at right angles to the long axis of the tube, as was expected, since it is in this direction that the size of the focal spot is changed. In the first instance, Figure 5 was taken as in Figure 1 A, the wires being merely a faint blur, while in the second, Figure 6, taken as in Figure 1 C, they show a definite line.

Fig. 4. Cathode elevated.

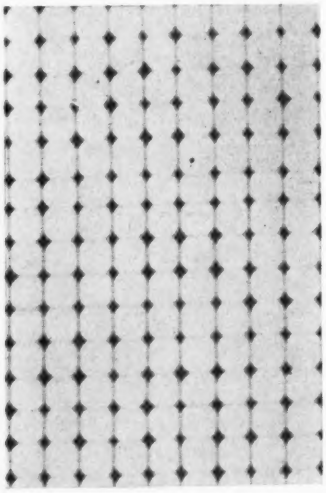


Fig. 5. Tube in position as in Figure 1 (A), with anode elevated.

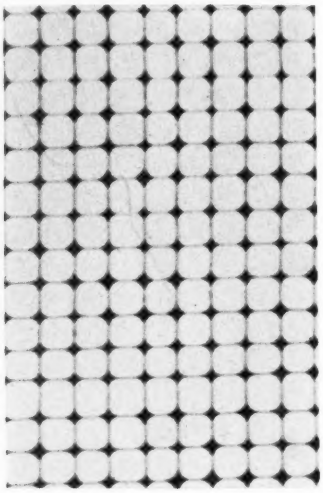


Fig. 6. Tube in position as in Figure 1 (C), with cathode elevated.

We have been using this position of the tube for the past four months, with marked improvement in our results, especially where very fine detail is required. The field has not been restricted nor the photographic effect changed. With the tube set at a 20° angle in the holder, a 14x17 film will be completely exposed at a 26-inch distance.

DEPARTMENT OF RADIODONTIA

UNDER THE SUPERVISION OF BOYD S. GARDNER, D.D.S.,
ROCHESTER, MINNESOTA

CASE HISTORY

The following case history from an article by Dr. E. C. Rosenow, "Experimental and Clinical Studies on Focal Infection and Elective Localization: Newer Findings and Their Significance,"[1] is of particular interest from the roentgenologic standpoint. The apparently negative X-ray pulpless tooth is an important factor in the systemic condition of the patient. Such data will tend to emphasize the importance of extracting all pulpless teeth when systemic conditions warrant such elimination, regardless of the evidence disclosed by the roentgen ray. In other words, the positive and negative roentgenograms of pulpless teeth fall into the same group.

"Case 2.—A middle-aged physician who had had repeated attacks of acute tonsillitis for many years, after two such attacks and while in medical school, developed hydrops of the left knee. He had had repeated attacks of lumbago, usually with mild myositis, involving chiefly the flat muscles around the back, neck and thorax. As foul-smelling, cheesy plugs kept forming in the tonsils, tonsillectomy was performed. The symptoms were absent for about two years. Then followed a loss of endurance, a prolonged low-grade arthritis, which involved the small joints of the hands, a number of attacks of myositis, irritability of the bladder, presumably due to infection of the prostate and a troublesome hyperchlorhydria. The joint and muscle symptoms became worse after inflammation of the tonsil tissue in the base of the left tonsillectomy scar. These symptoms, and those referable to the bladder, disappeared promptly after the removal of the remnant of the left tonsil, which contained a small abscess filled with foul-smelling pus. The streptococcus from this abscess and from shreds in the urine produced arthritis, chiefly of the peripheral joints, and myositis, in the four rabbits injected.

"About two years later the patient had an attack of myositis and subacromial bursitis, a typical attack of so-called 'painful shoulder,' and the symptoms referable to the bladder returned. They were never severe, but persisted for a number of months. The pain caused by the bursitis was severe at first, and was associated with tenderness of the deltoid and triceps muscles on the affected side. The symptoms grew milder during several months, and then persisted practically unchanged for nearly a year. The nine rabbits injected with the streptococcus from the shreds in the urine developed myositis and subacromial bursitis. A devitalized molar, believed to bear a causal relationship, was extracted, even though the roentgenogram was negative. A small granuloma was found so situated that its demonstration was impossible in the roentgenogram. The granuloma was incubated for a short time. A pure culture of slightly hemolyzing streptococci was isolated, and a large colony of streptococci was found near the apex in intimate relation to the blood vessels. The symptoms referable to the shoulder disappeared promptly, a result strikingly similar to those reported by Evans in this painful affection. No further joint or muscle symptoms developed for seventeen months, when a mild attack of myositis and symptoms of hyperchlorhydria again occurred.

"*Examination.*—At this time, three devitalized teeth with defective root-canal fillings were revealed. Two of these, the two left lower bicuspids, had been devitalized eighteen years before; the third, a right lower molar, had been devitalized six years

[1]Reprinted by permission from the *Journal of the American Dental Association*, Oct., 1924, p. 976.

before. The roentgenogram of the first two showed increased density of the structures around the roots, and one showed a faint line of rarefaction over the apex, while the molar appeared to be normal. The material, which was removed in a sterile manner from the canals of the first two teeth, contained pure cultures of a green producing streptococcus. Antiseptic treatments had efficiently sterilized the canals, but it was feared that the tissues beyond could not be thus sterilized, and the three devitalized teeth were extracted under ster-

Fig. 1. Appearance of devitalized tooth that became infected, showing no area of rarefaction five years after devitalization. With the streptococcus, the patient's condition was reproduced in animals.

ile conditions. Cultures from the apices showed streptococci in each. These cultures were injected into three rabbits, all of which developed characteristic lesions.

"*Course.*—Immediately after the extraction of these teeth, the patient developed a sharp attack of myositis of the lower right side of the thorax. A number of months after recovery from this attack, symptoms referable to the muscles and small joints returned, coincidental with an infection of the gum, which had become painful from pressure of an improperly fitting denture. With the correction of this difficulty, the myositis again subsided. At the time the three devitalized teeth were removed, it was believed that devitalization of a tooth, proved to be sterile, was a safe procedure, provided the root canal was filled properly in a sterile manner; hence, two teeth highly desirable for abutments were devitalized and the root canals filled by an expert, the filling being controlled by employment of the roentgen ray (Fig. 1). Roentgenograms were made from time to time, but no areas of rarefaction developed. About four years after devitalization of these teeth, the patient experienced gradually increasing pains around the smaller joints, recurring attacks of myositis and lumbago, stiffness of the muscles in the morning and lack of endurance. Owing to the increased severity of these symptoms and the absence of apparent foci elsewhere, the devitalized tooth shown in Figure 1 was removed. A pure culture of the streptococcus that had marked affinity for the muscles and joints of rabbits was obtained. Owing to this finding, it was decided that the other tooth devitalized at the same time should also be removed.

"A complete roentgen-ray examination, in which careful search was made for possible residual areas in the region of the jaw, from which teeth had been removed years before, revealed an area of rarefaction at the point where an infected third upper molar had been extracted, eight years previously. This area was curetted at the same time that the last devitalized tooth was removed. Cultures from the curetted material showed countless numbers of colonies and from the tooth a large number of colonies of partial-tension streptococci, which on intravenous injection into rabbits and guinea pigs produced severe lesions in the muscles and joints. Moreover, the roentgenograms revealed the presence of one of the gutta-percha points over the apex of the devitalized tooth (Fig. 1). After a third operation, performed two weeks after the last extraction to remove this gutta-percha point and the small granuloma surrounding it, a sharp attack of myositis of the back and thorax developed. The pains in joints and muscles since the elimination of these foci, five months ago, have largely disappeared, and endurance has increased.

"*Comment.*—The points of particular interest in this case are the symptoms of the same type recurring in numerous attacks over a period of many years, nearly always coincidental with the development of active foci of infection or acute infections

Fig. 2. Section of a granuloma over the apex of a tooth fractured eleven years previously in a patient suffering from an acute attack of iritis. The variation in age of the connective tissue as shown by the degree of cellular infiltration may be noted. Diplococci were readily demonstrable in the highly cellular areas near the blood vessels, especially along the periphery (Fig. 3).

of the nasopharynx, and the marked relief from these symptoms following the removal of the active foci containing the organism with which the symptoms were reproduced in animals. The facts that antiseptic treatments of the root canals, while efficiently sterilizing the substance of the tooth, did not sterilize the periapical tissues around the devitalized tooth, and that mere extraction of the infected tooth was not sufficient to prevent an encapsulated infected area in the jaw, are also significant. Control experiments with the cultures from the streptococcus obtained from the buccal mucous membrane at the time of the removal of this tooth proved negative.

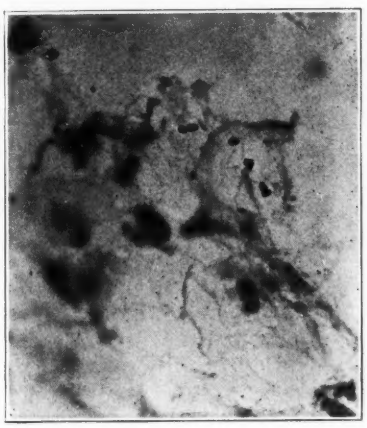


Fig. 3. Leukocytes and diplococci at periphery of the granuloma shown in Figure 2.

"Certain observers have suggested that the part played in the causation of systemic diseases by chronic localized infections around the teeth and jaws, particularly infected pulps, apical abscesses and granulomas, must be unimportant, because the wall of connective tissue in a granuloma makes invasion of the blood stream by bacteria impossible or highly improbable; and that, since these conditions are so often free

from symptoms, they must be harmless. In the light of the experimental results, this explanation is no longer tenable. It is well known that new blood vessels are formed during inflammatory reactions at the point of insult, in this instance due to living bacteria. It has been shown that the bacteria in granulomas and pulps of teeth occur chiefly at the periphery and where the connective tissue is highly cellular or embryonic in character; where leukocytic and round-cell infiltration is present; where new blood vessels are being formed, and adjacent to, or within, the larger blood vessels (Figs. 2 and 3). Hence, absence of symptoms should be regarded as evidence that good drainage is being maintained, rather than that these foci have become dormant and encapsulated."

Splenic artery aneurysm.—From a study of 40 cases of splenic artery aneurysm collected from the literature from 1847 to 1923 it has been found that 6 patients were operated upon and 4 of these recovered. The first one operated upon was reported by Winkler in 1905, with recovery. Four of the cases in which operation was performed have been reported since 1918. In all of the cases except one, diagnosis was made either at operation or autopsy. In this one case (Hoegler, 1920) there was what we may consider a fairly typical course of abdominal pain, gastro-intestinal hemorrhage, splenic tumor, and pulsating tumor of the epigastrium with murmur, X-ray study ruling out tumor of the stomach. At autopsy, however, a carcinoma of the pancreas was found as well as a small aneurysm of the splenic artery.

Thirty-three of the cases were diagnosed at autopsy. In most of these, death was directly due to the aneurysm. Many had had symptoms of abdominal pain or distress, enlarged spleen, and gastro-intestinal hemorrhage; a few had epigastric tumor with murmur. In most of them, the diagnosis was indefinite, which is shown also by the variety of diagnoses made. It is evident, as v. Schroetter suggested, that most cases are undiagnosed.

Conclusions.—With the symptoms of abdominal pain, gastro-intestinal hemorrhages, splenic and epigastric tumors (X-ray studies ruling out tumor of the stomach), aneurysm of the splenic artery should be considered and operation advised, for in operation lies the only hope of recovery in these cases.

W. W. Wasson, M.D.

Aneurysm of the Splenic Artery. E. A. Baumgartner and W. S. Thomas. Surg., Gynec., and Obst., Oct., 1924, p. 462.

Measurements of roentgen-ray intensity.—The percentage of roentgen-ray penetration will vary at various depths in the water phantom in different investigations unless all investigators follow a given set of standards. The authors endeavor to point out some of the tests necessary to be made of any ionization system before true ionization measurements of roentgen-ray intensity at a given point can be obtained. Failure by various investigators to observe these leakages accounts for the many different percentages of roentgen-ray intensity at a given depth in a water phantom, with apparently the same conditions for producing the rays, as voltage, distance, filter and field.

Studies were made of the aluminum equivalent of a 1 mm. copper filter, utilizing 200,000 volts, 4 ma. and a distance of 50 cm. With the horn ionization chamber 20 cm. from the filters, half submerged in water, it required 16.1 mm. of aluminum to give the same intensity of roentgen rays as obtained with 1 mm. of copper. A table is shown giving the position of the ionization chamber in a phantom of water with the corresponding percentage of roentgen-ray intensity as compared to the surface roentgen-ray intensity in a circular field, 16.6 cm. in diameter and a circular field 25 cm. in diameter. It was found that the roentgen-ray intensity with the ionization chamber half submerged in a circular field 25 cm. in diameter was 104.5 per cent of the roentgen-ray intensity of a circular field 16.6 cm. in diameter.

J. D. Camp, M.D.

Further Studies of Ionization Measurements of Roentgen-ray Intensity. J. L. Weatherwax and E. T. Leddy. Am. Jour. Roentgenol. and Rad. Ther., Aug., 1924, p. 110.

EDITORIAL

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WILHELM CONRAD ROENTGEN

His Life and Work

By I. SETH HIRSCH, M.D., New York City

(Continued from page 66)

THE DISCOVERY

It is late in the Spring of 1895. The ancient town of Würzburg is basking in the sunlight in the vine-clad valley of the Main. In the broad and tree-lined Pleicher-Ring is the Institute of Physics. Within its walls, in a room filled with scientific apparatus, a man stands deep in thought before a glass bulb glowing with colored light. He is of middle age, tall, heavily bearded, with a face almost spiritual in its aspect. His brow is broad, the eyes, though deeply set, glow with kindness; the lips are thin, the mouth firm. It is the face of an ascetic and a thinker.

This little glass tube he studies so intently as it glows and flickers with its iridescent hues—what an amount of thought, of painstaking, laborious investigation it represents! Plucker, Gassiot, Geissler, Hittorf, Varley, Crookes and Lenard, and before them all, Faraday,—how persistently the human spirit strives to find the meaning of Nature's mysteries! How crude the beginning, how halting the progress, how hidden the goal! How slowly the foundations are laid, often without definite plan, the walls rising haphazard, isolated, disconnected, until the master mind sets the cupola and lo! the structure glows with beauty and significance undreamed of.

In this vacuum tube, energized by the current of an induction coil, lie many of the mysteries and marvels, not only of modern electricity, but of matter itself—its ultimate constitution—the master problem of the universe. Geissler had passed the induced current through a tube of low vacuum and had produced the exquisite color effects. Hittorf had discovered the cathode ray therein. Crookes noted the change in the phenomena, as the vacuum was increased to about one-millionth of an atmosphere. On Hertz's suggestion Lenard brought the cathode stream out of the tube and studied it exhaustively.

All this was in the mind of Roentgen, then Professor of Physics at the University of Würzburg, as he watched the flickering bulb. He had spent twenty-five years of his life studying the changes in the physical, chemical, electrical and magnetic properties of matter under changes of pressure, and his investigations had taken him to the vacuum tube. He noted the beautiful green fluorescence of the glass of the tube, just as Plucker had done thirty-five years before, and thought of Crookes' designation of "radiant matter" as that influence which apparently radiated from the negative pole.

Absorbed in thought, he did not notice how quickly the hours flew. Called from the room, he laid the still glowing bulb on a book he had been reading that morning in which lay a large, flat, antique key, which it was his wont to use as a bookmark. It happened that underneath this book lay a photographic plate holder which he had prepared for an afternoon's outing. Returning later to the laboratory, he gathered up several plate holders, among which was the fateful one under the book, and spent the afternoon outdoors seeking recreation and amusement in the practice of his hobby, photography. He made several exposures.

On developing the plates a shadow of the antique key, his bookmark, appeared on one of them. He wondered how this could have happened. He showed the plate to his students and asked them for their ideas, but none of the explanations offered satisfied him. How came the image of the key upon the plate? The fogging of photographic plates in the proximity of energized vacuum tubes had been noted before, but to Roentgen's scientific mind this phenomenon demanded a satisfactory explanation and he proceeded to analyze it.

Hertz had said that something passed through the walls of the tube. But these were cathode radiations from the Lenard tube, which Lenard had so thoroughly studied. It was known that these cathode rays, when brought through the aluminum window of a vacuum tube moved in straight lines, discharged electrified bodies, penetrated thin substances, and affected photographic plates. But this was no Lenard tube with an aluminum window, but a relatively highly exhausted Crookes tube, and neither cathode rays nor ultra-violet light could pass through the glass of the tube and accomplish this. Roentgen decided, therefore, to search for the mysterious agent which had so silently recorded its presence. He restaged the drama, placing the glowing bulb, the tube, the key and the plate exactly as before, and energized the tube for the same time as on the preceding day. He developed the plate and lo! the shadow picture of the key was on the plate. Invisible light? Was some influence emanating from the glowing bulb that had the power of penetrating solid objects and affecting the photographic plate?

Let him who will speak in admiration of the poetic imagination which soars on spiritual wings in the world of fantasy, singing words that soothe the ear and weaving fancies that stir the emotions. The imagination of the scientist far transcends that of the poet, not only in the scope of its fancy, but surely in concrete accomplishment. The imagination of La Place reached out into the infinite heavens and made possible the measurement of the courses of the eternal stars, the weighing of them as in a balance, their analysis as in a test tube. In the microcosm the inspired imagination of a Pasteur pointed the way to the isolation of a host of organisms, whose destructive and constructive functions are so greatly the concern of medicine.

The imagination of Harvey lifted his eyes from the rutted paths over which legions of physicians since the time of Galen had travelled, to newer vistas where lay the truth of the physiologic problem of the circulation of blood. So, too, the imagination of Roentgen dared to dream of what was almost scientific heresy—invisible light.

Noting the green fluorescence of the glass of the Crookes tube, he conceived that other substances might be similarly affected. He surrounded the tube with a light-proof envelope and found that a platinobarium cyanide screen, even at a distance of nine feet, fluoresced brilliantly green in the darkened room. Eureka! He had it—a ray invisible to the eye which traversed solid substances. He placed his hand on a covered photographic plate, energized the Crookes tube above it, and obtained a photograph of the shadows of the bones. An interesting field of research seemed to open before him, and suspending all other investigations and excluding visitors from the institute, he devoted himself entirely to this work.

To study the invisible energy, to determine its nature, its origin, its characteristics—this was the work to be done. He carried on his researches in all phases of the problem and when convinced at last that he had discovered a new form of radiation, reported his results briefly on two occasions before the Würzburg Physico-Medical Society, December 28, 1895,[1] and

[1]Roentgen's address was greeted by prolonged applause. At the end of the lecture the right hand of the Honorary President of the Society, Prof. Kölliker, was photographed according to the new method. Prof. Kölliker thanked the lecturer in the name of the Society, for his address, which was unequalled in the annals of the Society. The proposition of Prof. Kölliker to call the new rays "Roentgen Rays" was unanimously adopted.

Prof. Kölliker opened the discussion and amplified Roentgen's suggestion of the possibility of

March 9, 1896, in a paper entitled "A New Form of Radiation." In 1897, before the Royal Prussian Academy of Science, in Berlin, he made a third communication, "On Further Observations of the Characteristics of the X-rays."

Let the captious critic point out that the placing of the glowing bulb upon a book containing a metal key and under which lay a plate holder, was a fortuitous combination of circumstances, a master stroke of the blind madonna of the pagan, Chance. Who will doubt, knowing the thoroughness of his methods, that sooner or later Roentgen would have made this discovery as a logical step in his researches?

* * *

After twelve years of service at Würzburg and at the special insistence of the Government, he accepted the position of Director of Technical Physics at the University in Munich, a position he held until the Spring of 1921. The Presidency of the Royal Physical Institute of Berlin was offered to him, but declined. Honors and titles from all corners of the civilized world were bestowed upon him. Immediately upon announcing the discovery the Emperor invited him to demonstrate the X-rays at the Palace of Potsdam, where he was awarded the Crown Order. The title of Excellence was given him by the German government and his statue was erected on the Potsdam bridge in Berlin. Columbia University awarded him the Barnard medal, and he received the Nobel prize for physics, the first of the awards made.

With the onset of the war Roentgen foresaw with prophetic vision and amazing clearness the defeat of Germany and the events which later transpired. He was in Munich when, emboldened by the general breakdown following the armistice, the Soviet revolution burst over this city. The mobs streamed from slums, seized the reins of government and proclaimed the proletariat and its philosophy—that poets were the prostitutes of capitalism; that religion was a soporific to stupefy the masses, and that science but devised new ways of enslaving the workingman.

Though himself a man of the people, he had attained intellectual aristocracy, and he openly expressed his abhorrence for this political philosophy which disparages the value of intellectual service in favor of materialism and ignorance.

Truly he was a man of the people. He came from the great class of toilers. Roentgen was a farmer's son, born and bred the son of a tiller of the soil, the oldest occupation in the world, wresting from the bosom of Nature, the sustenance for the body and the spirit, so essential to life. If, in a larger sense, science, by sublimed evolution, ascends from practical life, if the problems of daily life, the emergencies of practice, call out the highest powers and achievements from Archimedes of old to Roentgen of yesterday, then Roentgen is the master farmer, the great thinking farmer, delving deep into the very heart of Nature, seeking the secret of her structure, the ultimate constitution of matter, that man might better mould her tremendous forces and powers to his will. It is as if the dry-as-dust mechanistic and physical mind, refined to the point of impotency, returned through him to the soil for that needed renewal and revitalization, for the rustic physiological point of view, as Thompson and Geddes call it. The peasant, the farmer, the shepherd, "these silent servitors of life," furnish the elemental impulses by which the revitalized mind flows into the highways and byways of the mechanical and material world. The mind spiritual-

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using the new rays for medical purposes. The rich material of his clinic presented a fine opportunity for the use of the X-rays for the radiography of patients, and he hoped that Prof. Roentgen would co-operate with them in these experiments. At first thought, it seemed to him that diseases of the bones and joints should be investigated. In closing, Prof. Roentgen stated that for the penetration of parts of the body which are much denser than the arm and leg, larger tubes than those he had used would have to be constructed. He was working on this problem. Which inner parts of the human body would be visible with these improved tubes, could only be found in time. This would depend upon the degree of penetrability and their position in the body.

The chairman then closed this most important meeting by calling for three cheers for Roentgen and by thanking the lecturer for having selected the Physico-Medical Society for the first presentation of his experiments.

ized by contact with the humid earth, refreshed by great silences, stirred by starry skies, by golden sunsets, by crimson blossoms, inspired by snowy mountains, returns to the working world bound all day to the wheel of labor, hypnotized by nominal wages in money instead of real wages in life, befuddled by fair abstractions and fine sounds, and infuses such a world, blind to the real aim and significance of life, with idealism, courage and sanity.

Roentgen's last years were sad and lonely. His beloved wife died after a long illness, through which he nursed her with tenderness and devotion. When he resigned his university position as Director of the Institute of Physics, and retired, a great silence fell about him. For the most part all his old friends were dead. The old, ordered and well-established ways of life were changed. It was a harassed, tortured world, seeking rest and not finding it. He sought solace in work. But though his mind was clear and his mental vision undimmed, the infirmities of age were on him and he complained in a letter written to his friend, Wolfflin, a short while before his death, of the increasing physical difficulties which made laboratory work arduous. "I am old," he said, "the infirmities of age make work difficult, but I shall soon be well. I shall go to the Engadine, to my beloved mountains, the sunshine will rest me, the air restore me and I shall begin again."

But he was not destined to again see the mountains he loved so well, for, after a short illness, he died,[2] and there he stands eternal as the mountains, a towering figure in the realm of thought and achievement.

* * *

[2]Roentgen died of carcinoma of the rectum. He was not aware of the disease, which did not produce many symptoms. His last illness was very short. The symptoms of ileus, which appeared in the last two days, weakened him to such a degree that he passed away gently in the home of the widow of Professor Boveri in Würzburg. His ashes are in the cemetery at Giessen. He had no children.

(To be concluded next month)

THE PROGRESS OF RADIOLOGY[1]

It is indeed a very high honor and privilege to have been able to serve this Society for three years, first as First Vice-president, then President-elect, and, finally, this year as President. I hardly dare to hope the service rendered has been sufficient compensation for the honor conferred.

These three years have been critical ones in the life of the Society and many serious difficulties have had to be overcome. Unfortunately, some of these are still hanging over for final disposal by next year's officers, but we hope and trust they will be settled by the end of 1925, and that the worst of the trouble is already over.

If the responsibilities of my term of office as President have been grave, the compensation that came with the closer fellowship with the officers and members of this Society in our struggle for its preservation has made it well worth while. Never had the executive officer of any organization more loyal and whole-hearted support than has the President of this one. Indeed, there seems to be little doubt your Society could not have weathered the storm of the past year had it not been for the unselfish and self-sacrificing devotion of the officers and members to its welfare.

Before my inauguration into the office of President, I began the preparation of the scientific program for this annual meeting, and, with the loyal assistance of the Program Committee, have been able to present one which I trust has proven of value to you.

Unfortunately, sickness has deprived us of several essays by visitors of international fame, who would otherwise have been with us at this time. Harold Bailey, Joseph Colt Bloodgood, Maud Slye, James F. Ewing and Hermann Wintz of Germany are thus unable to be here. We are, however, honored by, and grateful for, their willingness and desire to come so far to serve our

[1]Presidential Address, delivered at the annual banquet of the Radiological Society of North America, at Kansas City, Dec. 11, 1924.

cause. Several of our own members who were to appear on the program are ill and unable to come.

The Radiological Society of North America is the largest society of its kind outside of Europe (the German Roentgen Society, I believe, has a somewhat larger membership). Our organization is young, progressive, liberal in its ideas, and full of vigor. It is maintaining a healthful, steady growth in members, distributed all over the North American continent. It is awake to the many problems in radiology which await solution. In the past it has not ignored, and in the future it must not disregard, the young man just entering the field of radiology. This Society must encourage him in every way possible to put forth his best efforts. He is the one to "carry on" to-morrow, when we older ones are laid on the shelf. No organization can live, if it does not constantly recoup its membership with young blood, which is desirous of work, is pregnant with ambition and enthusiasm.

Having been deprived of our official Journal of Radiology in 1923, we established another journal, known as RADIOLOGY. This has appeared promptly the early part of each month since September, 1923, and for several months past has contained about ninety pages of reading matter and about twenty-six pages of advertising. Under the capable editorship of Dr. Maximilian J. Hubeny, ably assisted by the associate editors, Drs. Edward W. Rowe and Benjamin H. Orndoff, and under the business management of Mr. J. R. Bruce, RADIOLOGY has immediately taken rank with the best in the world. In this connection, read the editorial letter of Dr. A. E. Barclay, President of the Roentgen Society of London, published in the December, 1924, number of RADIOLOGY.

Readers of RADIOLOGY during the past year have received a liberal education in medicine as related to roentgen diagnosis and therapy. During the next year, when the papers of this meeting are published, we feel the same high standard set by my predecessors in office will be continued, with the improvements that come with time and experience.

NEW DEVELOPMENTS OF THE PAST YEAR

During the past year Dr. Evarts A. Graham and Dr. W. H. Cole, of St. Louis, have developed a method of rendering the gall bladder visible by means of intravenous injections of sodium tetrabromphenolphthalein. This is a method that promises much for gall-bladder diagnosis. Graham described this procedure to this Society at its June meeting in Chicago this year. Who knows but it may be some time in the near future an opening wedge into the field of demonstrating the parenchyma of organs, their structure and function?

Dr. Lewis Gregory Cole, of New York, who has made so many valuable contributions to roentgen diagnosis, presented for the first time, at this same meeting, his film illustrating the normal motor phenomena of the stomach, sphincter, and cap. This demonstration was received with well deserved, enthusiastic rounds of applause. It was indeed a wonderful application of the cinematographic art to roentgenology of far-reaching importance in the proper teaching of the physiology of the stomach. At this meeting we have had his equally marvellous film cleverly describing "The Roentgen Diagnosis, Classification, and Prognosis of Pulmonary Tuberculosis."

While the water-cooled Coolidge tube for deep therapy was being tried out in the New York Institute for the Study of Malignant Diseases at Buffalo and at the Battle Creek Sanitarium during the year 1923, it was ready for distribution only in the spring of the present year. It has proven a great boon to deep therapy. Not that with it any more permanent cures of cancer can be expected, but it has so shortened the duration of treatment that the time of the radiologist and technician is greatly conserved, and "roentgen sickness" is diminished to a large extent.

In the diagnostic field a new Coolidge tube of equally great importance to the

water-cooled deep therapy tube is still confined to the experimental laboratory, but may be released in the near future. It is a fine-focus tube, which will carry about a thousand milliamperes of current at high voltage for short periods of time. It will enable us to make exceedingly rapid roentgenograms of such moving parts as the gall bladder, lungs, heart, etc. Some of the roentgenograms of the chest made thus, which we have seen, have a wealth of lung detail that is missing even in plates made in a short period of time by other tubes now in use.

The new upright plate shifter, brought out this year by the Kelley-Koett and the Victor Companies, is invaluable, and especially so in use with the new tube, to enable us to secure rapid stereoscopic plates of the chest and stomach. Great credit is due these firms for these contributions, and we are appreciative.

May we suggest to the manufacturers a further development in the plate-changer, which will automatically and rapidly move a large cassette inside a tunnel between short exposures? By this means the entire motor phenomena of the heart, stomach, small intestines, etc., could be demonstrated. The motion of joints might also be studied by this means to great advantage. Such an apparatus would appear to be practical.

OUR RELATIONSHIPS WITH OTHER SOCIETIES

The American Roentgen Ray Society has cordially co-operated with our organization. This is evidenced especially by the establishment of the Technicians Bureau, which has emerged this year, a strong, full-fledged institution. The same difficulties which have assailed our Society during the past three years have handicapped seriously the proper functioning of this Bureau until now.

The establishment of this Bureau is a much-deserved recognition of the trained technician, which places him on a plane where he will realize fully his professional responsibilities, and where he will bring honor and credit to his vocation. It will, no doubt, be the means of providing more expert service for roentgenology, and will tend to discourage those who unjustifiably or unethically assume the functions and duties of the roentgenologist. Thus it should be encouraged and supported in every way possible.

We are very glad to have an official representative from the American Roentgen Ray Society at the speakers' table this evening in the person of Dr. A. C. Christie, who is also one of our good fellow members.

The American College of Radiology was organized at the time of the San Francisco meeting of this Society, in June, 1923, largely through the efforts of our esteemed past-President, Dr. Albert Soiland, who is its Secretary. At Chicago last June the College had its first annual meeting. The degree of Fellow of the American College of Radiology was conferred at this time upon the charter members and those elected at Chicago. The objects of this organization are similar to those of the American College of Physicians and the American College of Surgeons, and its influence in keeping the science and art of radiology on a high plane will no doubt be very great.

This year, for the first time, largely through the efforts of members of this organization, there was a temporary section on radiology in the meeting of the American Medical Association. A most excellent program was presented. The sessions were well attended in spite of the fact that this Society had had a two-day program just before. So successful was the experiment, the Association has continued the section for the Atlantic City meeting next May, and after that it is likely to become permanent.

We have had most cordial invitations to attend the German Roentgen Society this year and the International Congress on Radiology at London, next June.

Dr. Wetterer, of Mannheim, Germany, who is preparing an extensive Index Radio-

logorum, has honored this Society by appointing its president an American Trustee of the fund established by the profits derived from the Index. This fund will be utilized to assist needy families of roentgenologists the world over. The Index is to be published in several languages, including English, and should be of very great value to radiologists.

Our Society should endeavor to cultivate cordial relationships with other organizations, domestic and foreign. It would be of advantage to all to appoint delegates to represent our Society at some of the meetings of foreign societies, if agreeable to them, as I have no doubt it would be. In that way we could better keep in touch with what is going on in radiology in various parts of the world. Members who are likely to be in foreign countries at the time of meetings—and this often happens—should notify the President of this Society.

Our Society has been invited to send a delegate to the Pan-American Congress of Science, meeting at Lima, Peru, December 20. The time of this meeting did not permit members who attend our annual session to arrive there in time. Dr. James T. Case is representing several other Societies and is now on his way to Lima, and I have asked him to represent this Society.

THE IMMEDIATE FUTURE OF RADIOLOGY

The future of radiology on this continent lies very largely in the hands of our Society. What is it going to be? This will depend upon several factors.

The function of the Radiological Society of North America is largely educational. We should aim to make our educational work as broad and deep as possible. And that means that much thought and care must be put into the development of our scientific programs. First of all, many of us are apt to forget, when we become radiologists, that we are, or should be, physicians first, and only radiologists as specialists to correlate and co-ordinate our knowledge of general medicine with our special roentgenological knowledge. We should undertake radiation therapy of a case only when we are able to diagnose and prognose it, be it a disease of the internal organs, or one of the skin. It is our duty, as radiologists, to obtain the most complete knowledge possible of general medicine. Perhaps in no medical specialty is this so fundamentally important as in ours. If this Society is to develop the best possible radiologists in the future, its programs must be laid out with the care and wisdom that one would exercise in planning a college curriculum. The hit-and-miss type of program, with papers on topics which are but slightly related to each other, if not absolutely unrelated, presented by members who simply write papers because pressed to read essays before the Society, should not longer continue. If a member has a subject he desires to present, he should send a synopsis to the Chairman of the Program Committee early, and if it can be made to fit in with the general plan of the program and is worthy of a place, well and good. But if not, the member should not feel hurt, if it is rejected. He should consider it a great honor and privilege to read a paper before this Society, as indeed many do. The main part of the program, however, should deal with medicine in general and radiology in particular. For instance, in order to get a complete picture and comprehensive understanding of the peptic ulcer, we should correlate the various phases presented by competent pathologists, internists, surgeons, and radiologists.

To consider the radiological findings without relating them to the whole medical aspect of the diseased individual would be to lend color to the opinion of those who are inclined to class us as "glorified technicians," rather than as medical consultants. Real consultants we all desire to be. Whether in the future we are, or are not, will depend upon our general medical knowledge, as reflected in our attitude toward other branches of medicine, and our handling of patients.

Therefore, in order to secure, for the benefit of our Society, the results of recent

valuable research work, and to bring men from other related branches of medicine to our meetings, it will be necessary to establish a fund to compensate the contributors. They do not get compensation, as we do, in the publicity given and the knowledge acquired from the rest of the meeting. If the money which the Society and some of its members have been forced to spend upon needless and annoying litigation during the past year had been put into such a fund, we would already have a large endowment for such purposes.

In considering the future development of our specialty and of medicine in general, we must also emphasize the importance of under-graduate training in the roentgenological aspects of anatomy, physiology and pathology. One of our members, Dr. P. M. Hickey of the University of Michigan, is a noted pioneer in this work. This same training must be further developed in our post-graduate teaching of hospital internes, and young physicians in clinical roentgenology.

RADIATION THERAPY

The most important problem in connection with radiation therapy is and always has been the biological reaction of tissues to this physical agent. Our science to date has been developed more or less empirically, just as has been the case with other branches of medicine. That is, we have tried the effects of radiation in disease, and from them have drawn conclusions about the normal tissue reaction. The time has now come when we must start a systematic investigation of the pharmacological effect of rays of different wave lengths and quantity on the individual biological units from the component parts of cells to entire organs.

But as important as is the exact knowledge of the pharmacological action of the rays is a knowledge of the etiology of diseased conditions to be treated.

Our greatest interest is concentrated upon the cause of cancer. Taking into consideration all the facts so far disclosed, I am inclined to believe that, if the predisposition to cancer is inherited, any irritation, or specific infection may bring about the development of the cancerous lesion. But, if a cancerous constitution is not inherited, these same factors will not lead to a malignancy. Further advances would seem to lie in the direction of influencing this cancerous constitution by radiation. Our present system of application to circumscribed regions, which is without doubt often of local curative value, and has more or less temporary, general effect, according to this conception is not ideal. Therefore, a more permanent form of irradiation by injections into the blood of radio-active solutions, may be able to change the metabolic balance of the organism.

Such is a brief survey of our year's work and prospects of future lines of development.

While I retire from the executive chair, I wish to assure the Society of my continued interest and co-operation.

Again I wish to thank you for the high honor you conferred upon me and for your co-operation in the management of the Society and development of its program during the past year. Our appreciative, heartfelt thanks are due our Kansas City friends and co-workers for their splendid arrangements for our comfort and entertainment. I wish to thank our honored guests for their presence at this meeting and for their valuable contributions. May the Radiological Society of North America continue to progress and to develop radiology to the highest plane possible, to the end it may be of the greatest service to mankind.

ROLLIN H. STEVENS, M.D.

The meeting of the Central Section of the American Roentgen Ray Society will be held in Detroit, February 19, 20, and 21, 1925. The first day and a half will be devoted to the study of cancer, at which sessions such men as Bloodgood, Codman, Ewing, Burnham, Desjardins, A. B. Moore, Evans, Warthin and Hickey will take part. The other day and a half will be devoted to diagnosis.

INTERNATIONAL CONGRESS OF RADIOLOGY

LONDON, JUNE 30, 1925

Your committee after due consideration have decided that Thos. Cook & Son are able to handle the arrangements for the delegates in the best possible manner. Three official trips have been decided upon as here mentioned.

The rates shown provide for reservations on the ocean steamer at the rate of $300.00 each way, plus $5.00 war tax for the outward accommodation, and in the event of either cheaper or more expensive accommodations being taken, adjustment in the rate will be made.

The prices quoted provide for first class transportation tickets and first class hotels, including a bed in a double room without bath (which can be arranged for at an additional charge), and meat breakfast in England and plain breakfast on the European continent, also transfer of passengers and hand baggage to and from the steamers, hotels and stations and the necessary European war taxes levied on hotel accommodation.

Thos. Cook & Son also have arranged for three other tours, namely, Tour No. 4 which includes Great Britain, Norway, Sweden and Denmark, Tour No. 5 which includes also, in addition to these countries, Germany and Holland, and Tour No. 6 which covers one week in London and a week in Paris, this latter tour taking thirty days from New York back to New York, which should prove quite attractive to many of the delegates.

While these special rates have been made for delegates to the International Congress, attention is called to the fact that guests of the members may also participate in these reduced rates.

Applications should be addressed to Thos. Cook & Son, 585 Fifth Avenue, New York City, attention Mr. C. R. Wright, when they will receive prompt attention, and allotments of accommodation will be made upon receipt of the amount of $25.00, which should accompany the application as deposit. In order to obtain choice accommodations application for membership should be made at once, and should be received by Thos. Cook & Son by January 1 *and not later* than February 1, 1925.

DR. A. C. CHRISTIE,
DR. C. EASTMOND,
DR. LEOPOLD JACHES,
DR. F. M. LAW,
DR. W. H. STEWART,
Arrangement Committee.

OFFICIAL TOUR NO. 1: $655.00

Wed., June 24: Sail from New York per S. S. *Mauretania.*
Mon., June 29: Arrive Southampton and rail to London.
Mon., June 29, to Sat., July 4: At London.
Sat., July 4: Rail to Southampton and sail per S. S. *Mauretania* for New York.
Fri., July 10: Due at New York.

OFFICIAL TOUR NO. 2: $688.00

Wed., June 24: Sail from New York per S. S. *Mauretania.*
Mon., June 29: Arrive Southampton and rail to London.
Tues., June 30, to Tues., July 7: In London (Hotel Langham).
Wed., July 8: Rail to Southampton and sail for New York by White Star Line S. S. *Homeric.*
Tues., July 14: Due at New York.

OFFICIAL TOUR NO. 3: $775.00

Wed., June 24: Sail from New York per S. S. *Mauretania.*
Mon., June 29: Arrive Southampton and rail to London.
Tues., June 30, to Tues., July 7: In London (Hotel Langham).
Wed., July 8: Rail to Oxford.
Thur., July 9: Rail to Manchester.
Fri., July 10: To Glasgow.
Sat., July 11: By rail, coach and steamer through the Trossachs to Edinburgh.
Sun., July 12: In Edinburgh.

Mon., July 13: Rail to Cambridge via Cathedral Route.

Tues., July 14: In Cambridge. Afternoon train to London.

Wed., July 15: Rail to Southampton and sail for New York by White Star Line S. S. *Majestic.*

BRITISH INSTITUTE OF RADIOLOGY

MEMORANDUM OF OBJECTS AND APPEAL FOR FUNDS

Officers, 1924-25

President: SIR HUMPHRY ROLLESTON, Bt., K.C.B., M.D., D.C.L., LL.D., President of Royal College of Physicians, London; Vice-Presidents: ALFRED E. BARCLAY, M.A., M.D. (Manchester); C. THURSTAN HOLLAND, D.L., Ch.M. (Liverpool); ROBERT KNOX, M.D. (London); Hon. Treasurer: S. GILBERT SCOTT, M.R.C.S., L.R.C.P. (London); Secretary: JOHN MUIR, B.Sc., M.B., Ch.B.

The study and development of radiology and electro-therapeutics in medicine and surgery is now so extensive that the establishment of a central bureau or clearing house is absolutely necessary.

The British Institute of Radiology has been founded with this in view, its object being to house, co-ordinate, and to extend the work of existing radiological societies. It will also constitute a center for professional and social intercourse amongst those interested in such work, and in this way it is hoped to establish closer and more intelligent co-operation with workers in other branches of the medical profession.

House.—Very largely through the keenness and initiative of the late Sir Archibald Reid a start has been made, and the nucleus of the B. I. R. was inaugurated at 32 Welbeck Street, a few months before he died.

Memorial.—The foundation of the Institute is intended to form a worthy memorial to those pioneers who sacrificed their lives in the early work of radiology; the names of these will be perpetuated in the scheme in a fitting manner.

Meetings.—It is hoped that the house will serve as headquarters for all the existing radiological societies, whose meetings will be held in the lecture hall — lately the chapel of the Russian Embassy. It is essential that the medical workers in radiology should co-operate and collaborate, not only with their fellow-workers in medicine and surgery, but also with the physicist and technical manufacturer. The existence of a common meeting ground for discussion will assist materially in securing this.

Central Bureau. — The functions and scope of the Institute must in this respect await, and be modified to some extent by, later developments, but the opportunities for usefulness are many and varied, in collection and co-relation of professional reports, in tabulation and circulation of information, as a place of reference regarding workers in all branches of radiology, etc. Hospital authorities may find the bureau useful in furnishing information regarding X-ray departments and their equipment and staff.

Educational. — The Institute will be a suitable center for educational courses, both systematic and intensive. Classes for candidates for the diploma in radiology instituted for medical graduates by the University of Cambridge, and for the diploma instituted by the Society of Radiographers, are already being held or are in process of organization and other classes will be held as occasion demands. Besides classrooms and lecture hall, the provision of rooms fitted for demonstration, with accessory photographic offices and apparatus, will be of great assistance in the systematic training.

Research.—At present it is intended to leave clinical and therapeutic research to existing organizations, the directors of which should, however, find the Institute of great value for reference to work of others, for co-ordination of work to be undertaken, and for co-relation of results. Research into methods of diagnosis may, however, be

conveniently carried out at a center such as that here suggested, and it is hoped at an early date to undertake work of this nature.

Journal.—The British Journal of Radiology will continue to be published monthly as the official organ of the Institute and by amalgamation with other journals it is hoped to increase its circulation and value so as to make it self-supporting, thus leaving members' subscriptions to be applied entirely to the development of the Institute.

Reference Library. — The formation of an adequate reference library is provided for. The nucleus has been furnished by the presentation of the library of the late Sir J. Mackenzie Davidson, the book cases and books of which have been generously presented by Lady Davidson.

Reference Collection of Radiograms.—A reference collection of radiograms illustrating the normal and pathological in films, prints and lantern slides, is a scheme in which the late Sir Archibald Reid took the keenest interest. It is proposed to dedicate the collection to his memory, and to invite special donations for the necessary equipment. This collection should be of value not only to radiologists but to physicians and surgeons who take an active interest in this branch of work; further, by means of duplicate sets, which may be had on loan by medical schools or individuals, the use of the collection may be extended for the purposes of teaching and lectures at other centers.

Advisory Center for Visitors.—For professional visitors to London, from the Colonies and elsewhere, the Institute should prove most helpful as an information bureau, where hospital arrangements or particulars of demonstrations may be ascertained, or advice secured on any matters pertaining to radiology and its practice in this country. The aid of the director (who would be in close touch with all the hospital departments and others concerned) will enable such visitors to spend a much more profitable time in this country than might otherwise be possible.

Exhibition of Apparatus.—Periodical exhibitions of new apparatus will be arranged whereby it is hoped to assist and stimulate the British manufacturer, as well as members, to keep up-to-date in such matters.

Economy. — Incorporation and amalgamation of existing societies will effect an economy in subscriptions for many members.

International Congress.—A Congress, organized by the Institute in conjunction with the Rontgen Society and the Electro-therapeutic section of the Royal Society of Medicine, will be held in the early Summer of 1925. The Institute House will be used as headquarters and this makes it incumbent to complete the furnishing and equipment of the premises at the earliest possible date.

Annual Income. — The annual income seems well assured from the support promised and anticipated as a result of this appeal.

Capital Expended.—The purchase of the lease and the essential furnishing of the Institute have absorbed such small capital as was available from the Mackenzie Davidson memorial fund and a few private subscriptions. There is a mortgage of £2,000 advanced by the bank on the security of the lease. A fuller financial statement will appear in an early number of the *Journal* but it will be readily evident that further capital is required to initiate the activities of the Institute.

Appeal.—We are therefore appealing for a capital sum of £6,000 to wipe out the bank debit and to provide a nucleus for further development.

Your assistance is solicited in one or more of the following ways: (a) By donation to the General Foundation Fund; (b) By donation earmarked for the Reid Memorial collection; (c) By becoming a member (£1 1s. 0d. entrance and £3 3s. 0d. annually) entitling to receipt of *Journal;* (d) By becoming a life member (£50 0s. 0d.) entitling to receipt of *Journal;* (e) By becoming an associate (10s. 6d. entrance and £1 11s. 6d. annually).

On behalf of the Council of the British Institute of Radiology,

HUMPHRY ROLLESTON, *President.*
S. GILBERT SCOTT, *Hon. Treas.*
JOHN MUIR, *Secretary.*

32, Welbeck Street, London, W.1.
November, 1924.

SUPREME COURT, STATE OF MINNESOTA

The Secretary of this Society has in his possession several copies of the "Brief of Respondents" in the trial of Albert F. Tyler and The Radiological Publishing Company, *Plaintiffs-Appellants, vs.* John R. Bruce, Russell D. Carman and Radiological Society of North America, Inc., *Defendants-Respondents,* which may be borrowed by any member of the Society.

REPORT OF AMERICAN REGISTRY OF RADIOLOGICAL TECHNICIANS

Since the last report the work of the American Registry of Radiological Technicians has become better organized and a consequent increase in the number of applicants examined for registry has ensued. At the present time, 184 technicians have registered; 139 certificates have been issued; 50 applicants are in the process of examination, and a number of applications were received at the Kansas City meeting.

A system of recording all applications received and examinations given has been inaugurated, as follows:

A Registry record book is maintained, in which a complete record of applicants, whether finally examined or not, is entered according to the date of the receipt of application. In this book are noted the name and address of the applicant, date of receipt of application, photograph, and fee; when examination questions are sent out; when the completed examination is returned and forwarded on to the office of the examiner; when it is returned for filing in the office of the Executive Secretary; date of issuance of certificate and date of renewal for each year.

In addition to this, an index card file of applicants, arranged alphabetically by name, is kept as a cross reference to the date in the record book. This gives all the information necessary for quick reference.

The property, correspondence, and examination supplies, which were formerly kept in Omaha, have been received at the St. Paul office. Some confusion has arisen, due to the change in the office from Omaha to St. Paul, but this is gradually being straightened out. When the first year of registration has expired, letters are sent out to all the technicians, notifying them that their renewal will be necessary. For some time we attempted to issue the certificates every three months, but this caused so much delay and so much piling up of work that the Secretary is now taking care of them as fast as they come in. It now requires about six weeks from the time the application is received until the certificate can be sent out.

The financial condition of the Registry, as well as the large number of inquiries and the increasing number of registrants, all indicate that the Registry will go on. It will be not only a financial success but will meet a long-felt need of the better class of Radiological Technicians. Much credit is due the members of the Radiological Society of North America and the American Roentgen Ray Society for their interest and co-operation in the matter of sending in names of applicants. Also, to Mr. Jerman, for his untiring efforts, which have resulted in a large number registering within the past few months. We also wish to express appreciation of the courteous and willing co-operation on the part of various members in supervising examinations. It is largely through their promptness that this office has been able to complete the registration of applicants with greater celerity than was heretofore the case.

Much time will be saved if all communications, not of a personal nature, be sent

in care of Mr. J. R. Bruce, Guardian Life Building, St. Paul, Minnesota.

(Signed) E. W. Rowe,
Lincoln, Nebr.

To the Catholic Hospital Association

As Chairman of the Committee on Radiological Technicians, I respectfully submit the following findings of the Committee:

Since the appointment was made, a plan has been outlined and with the co-operation of the central office at Milwaukee a questionnaire has been sent out to every Catholic hospital in the country. Replies have been received from over one hundred different hospitals. From these replies, certain interesting facts may be deduced.

It is interesting to note that all the hospitals responding to the questionnaire are equipped with radiographic and dark room service and that only one of the hundred is not equipped for fluoroscopic examination. Ninety-seven are equipped for superficial therapy and thirty-six for deep therapy. Eighty-two have a sister in charge of the department. Twenty-three have nurses. Thirty-three have intern service in the department and ten have pupil technicians. Fifty-two are equipped with a bedside unit and eighty-two with a Bucky Diaphragm. Ninety hospitals follow the routine of getting a general examination of the patient before requesting the X-ray examination. It appears to us that this routine is wise in so far as it gives the physician in charge a more complete knowledge of the case, as well as minimizing unnecessary exposures and X-ray films. Sixty-seven of the hospitals have submitted forms which are used for requisitions and reports of X-ray examinations. In fifty-nine hospitals the X-ray department is adjacent to the surgical operating department, making it much more convenient for the fluoroscopic reduction of fractures and removal of foreign bodies. Seventy-eight hospitals have a physician roentgenologist in charge of the department, while twelve follow the system of having an attending physician make his own interpretation of plates made by the technician in charge of department.

The treatment is directed by the medical roentgenologist in sixty-four hospitals, while in nineteen it is directed by the physician attending the patient. In seventy-nine the radiologist acts as a consultant with the other members of the staff. In fifty-one the radiologist receives a percentage of the gross receipts, while in fourteen he is paid a flat salary. In thirty-three hospitals the work is supervised by a physician radiologist, and in three hospitals by the attending physician. In eighty-three cases the hospital owns the X-ray equipment and collects the fees.

The X-ray findings are written in ninety-four hospitals, a copy of the findings being filed with the patient's chart in ninety-two hospitals.

It would appear from the answers returned to this questionnaire, that the majority of the Catholic hospitals are equipped with X-ray apparatus sufficient to take care of their needs and that in most cases a physician radiologist supervises the work of the department. It seems to us that some arrangement might be made so that both large and small institutions would have the advantage of the physician radiologist, as this would render the greatest service to the patient and members of the staff.

As Dr. James T. Case has said, "It is apparent that the interpretation will be all the more valuable and helpful if the roentgenologist is furnished with the history and such clinical data as are available up to the moment of the roentgen-ray examination. Moreover, the roentgenologist should not be treated as though he himself were constantly on examination and every patient sent to him as a catch problem, but he should be regarded as a colleague and be provided with every fact likely to assist him not only in the interpretation of the case in hand, but also in his own development into a better, broader and more useful clinician."

It is urged that this close co-operation between the X-ray department and the other

departments of the hospital be the ideal sought.

It would appear from the questionnaire that relatively few hospitals are keeping a cross index of the work done in the X-ray department. It is the feeling of the Committee that this has great usefulness. The cross index should be kept both by anatomical parts and by subject.

It is further suggested as an idea for further development that a film library be built by each institution. If films of superior quality are later obtained these could be substituted for those of inferior quality in the files. With these films brief notes could be filed, giving the salient points in the history, clinical, operative and microscopical findings in the particular case. A film library of this type would be invaluable as the years pass by.

To summarize briefly what our suggestions are, we may state the following points:

Firstly, To have the X-ray department adjacent to the operating pavilion.

Secondly, That the roentgenologist be a physician.

Thirdly, That the technician be a sister.

Fourthly, That the requisition blanks and records be uniform.

Fifthly, That there be perfect co-operation between the roentgenologist and the staff.

SISTER LIBERIA,

Chairman of the Committee on Radiological Technicians of the American Catholic Hospital Association.

RADIOLOGY

AMERICAN MEDICAL ASSOCIATION

At a recent meeting of the Council on Scientific Assembly of the American Medical Association, it was decided to devote three sessions of the section on "Miscellaneous Topics" to Radiology, at the meeting to be held at Atlantic City, May 25th to 29th, inclusive.

All those who attended the Chicago meeting will recall the success, both in attendance and quality of the program, and it is hoped that all those interested in Radiology will attend the meeting at Atlantic City. *When registering, please be sure to specify Radiology,* as the interest shown will determine whether a separate section will be granted next year.

The officers appointed were: Dr. P. M. Hickey, Chairman; Dr. Russell D. Carman, Vice-chairman; Dr. M. J. Hubeny, Secretary.

DEATHS CAUSED BY IMPURE BARIUM SULPHATE, USED IN ROENTGENOGRAPHY AS A CONTRAST AGENT[1]

Berlin, Nov. 29, 1924.

According to a report of the Federal Department of Public Health, several deaths have occurred recently in Germany and also in foreign countries through the use of barium sulphate as a contrast agent in roentgenography. The barium sulphate was in these cases found to be strongly contaminated with soluble barium compounds or with compounds that became dissolved by human gastric juice. Of itself, barium sulphate, when it is pure, is a harmless agent for roentgenographic transillumination purposes, as has been proved beyond question during the last fourteen years since Prof. Paul Krause (formerly in Bonn, now in Münster) introduced this insoluble barium compound into medical diagnosis for the purpose mentioned. On the basis of replies to a questionnaire sent to directors of various institutions, Krause and Köding have reported that in approximately 130,000 cases barium sulphate has been employed as a roentgenographic contrast agent without causing any injury whatever. This statement agrees with the observations of analytic chemistry, which

[1]Reprinted by permission from *Jour. A. M. A.,* Dec. 27, 1924, p. 2108.

teaches that, from a practical standpoint, barium sulphate may be regarded as a substance that is insoluble in water or in dilute hydrochloric acid. To be sure, Prof. L. Lewin (pharmacologist in Berlin) has expressed the view that also pure barium sulphate may find in the human organism the required conditions for going into solution, but this view lacks confirmation. Barium has speedily supplanted bismuth subnitrate, which was formerly employed, and cannot be replaced by magnetic iron ore (magnetite), which has occasionally been recommended. In the two recent cases in which loss of human life has resulted from the use of barium sulphate, the preparations of barium sulphate employed were found to contain upward of 50 per cent of barium carbonate. Such accidents can be avoided if manufacturers, pharmacists and physicians will see to it that for the purposes mentioned only pure preparations are manufactured, sold or applied. The Federal Department of Health has got in touch with representatives of two large pharmaceutical houses that produce barium sulphate for transillumination purposes, and it would seem that the manufacturers are taking great precautions in selecting the original material as well as in the manufacture and distribution of barium sulphate, in order that accidents may be prevented. The Federal Public Health Service has gone still further in its investigation, and has examined all the more common market brands of barium sulphate and of barium sulphate mixtures containing various suspension substances and sweetening agents, with a view to discovering the content, if any, of barium carbonate and soluble barium compounds. None of the samples examined contained admixtures in sufficient quantity to be deleterious to health, but were, for the most part, essentially free from injurious substances.

In order that it may be possible for every physician and, if necessary, for the caretaking personnel to establish, by the use of simple agents and with little loss of time, the unobjectionable character of an unknown or suspected preparation, the Prussian Minister of Public Welfare has issued instructions for the testing of barium sulphate, which have been worked out in the Federal Department of Health on the basis of the testing regulations published by the German Apothecaries Society in its supplement to the Deutsches Arzneibuch (the pharmacopoeia of Germany). This method has proved reliable, and in order to ascertain just how small quantities of barium carbonate occurring in barium sulphate may be demonstrated by this test, mixtures of pure barium sulphate and barium carbonate containing, respectively, 2.1, 0.5, 0.2, 0.1, 0.05 and 0.01 per cent of barium carbonate were prepared and then subjected to the test. It was found that a barium carbonate content of 0.05 per cent could easily be demonstrated while a barium carbonate content of 0.01 per cent could be just barely detected.

The Minister demands that the manufacturers of barium sulphate for roentgenographic transillumination purposes take note of the great danger that threatens patients for whom barium sulphate is thus employed if the preparation used contains even minute quantities of barium carbonate or soluble barium compounds. For a single illumination, from 100 to 150 gm. of barium sulphate is used. The manufacturers concerned must therefore exert their best efforts to prevent anything but pure barium sulphate from being put on the market. Furthermore, he recommended that the attention of physicians and pharmacists be called to this test of barium sulphate for its content in barium carbonate or soluble barium compounds, but urged that they be reminded that barium sulphate mixtures cannot be tested by this simple and sure method, as their suspensions cannot be so readily clarified and filtered. While, under ordinary circumstances, there is no occasion to test barium sulphate preparations, if, in an individual case, for any reason one of these preparations is suspected, it should not be used until it has been care-

fully tested in an official chemical laboratory and has been found to be pure.

The official method of testing barium sulphate for its content in barium carbonate and soluble barium compounds follows: About 5 gm. of the barium sulphate to be examined is placed in a flask or beaker; 50 c.c. of a 10 per cent solution of acetic acid is added and the contents are shaken, at which time it should be noted whether or not carbonic acid is developed. Since any evolution of carbonic acid would point to the presence of barium carbonate, such a finding would awaken grave suspicions against the preparation, and it should not be used for roentgenographic transillumination purposes. As a rule, no evolution of carbonic acid will be noted, and after the contents of the flask have been boiled for a few minutes, the undissolved barium sulphate is allowed to settle and the supernatant fluid is poured off through a filter paper. The resulting filtrate, which will usually be turbid, is then thoroughly shaken after a small quantity of animal charcoal on the point of a knife has been added. The filtrate is then refiltered, if necessary, two or three times, until it has become entirely clear. To about 25 c.c. of the clear filtrate a few drops of dilute sulphuric acid are then added. If inside half an hour the filtrate becomes turbid, the preparation should be rejected, as it contains 0.1 per cent or more of barium carbonate or soluble barium compounds. If the filtrate remains clear, the barium may be safely used as a contrast agent in roentgenographic work.

BOOK REVIEWS

THE DOCTOR LOOKS AT LITERATURE. PSYCHOLOGICAL STUDIES OF LIFE AND LETTERS. 317 Pages.

TAKING THE LITERARY PULSE. 317 Pages. By Joseph Collins. New York: George H. Doran Company.

The time-honored theory that a physician must not deviate from the beaten path of his professional labors to indulge in literary or other relaxation is rapidly becoming obsolete. The magnificent contributions of Oliver Wendell Holmes and Silas Weir Mitchell, not to mention many others who have achieved brilliant and lasting fame not only in their chosen lines of professional activity, but in literature, science and art as well, would be sufficient to controvert this fallacious idea. The truth is, the doctor is better for the hours of relaxation devoted to his hobby—better mentally and physically, whereby he is able to labor more efficiently among his patients. In this connection, these two books by Dr. Collins, an eminent neurologist and psychologist, are a creditable work for any *litterateur*. They are, in brief, critical, analytical, and psychological studies of the work of some of the more recent literary men and women, including Dostoievsky, Georges Duhamel, Rebecca West, Virgina Woolf, James Joyce and others. Some of these authors are not widely known—probably because of their close proximity to the present time or because they write not for the masses but for the intellectuals, the leaven of mankind. It is probable that not everyone who reads these polished essays will agree with the conclusions of the talented author. It is not necessary that they should. It must be admitted, however, that Dr. Collins opens up many original avenues of thought. We can recommend these books for the evening hour, when the day's work is over.

W. A. NEWMAN DORLAND, M.D.

LATERAL CURVATURE OF THE SPINE AND ROUND SHOULDERS. By ROBERT W. LOVETT, M.D., Sc.D., Boston. Fourth Edition, Revised, 217 pages, 172 illustrations. P. Blakiston's Son & Company, Philadelphia. Price, $2.50.

There are few conditions in the realm of medicine and surgery that are more stubborn to treat than the true lateral curvature of the spine. We always welcome any new suggestion or method of treatment of this condition, and especially when coming from such a master as the late Robert W. Lovett. This little volume is enriched, not only by

the broad experiences of the writer, but by his untiring research of the literature for every phase in the study of this maiming deformity.

The book is well proportioned, being divided into fourteen chapters.

The first chapter gives a most illuminating historical and bibliographical sketch of lateral curvature. This chapter is indeed most interesting.

The next three chapters are given to the description of the spinal column—the anatomy, movements and mechanisms.

The next chapter, dealing with examination and record of the case, is a very important subject, and is well handled.

The next seven chapters are given to the pathology, etiology, diagnosis and treatment.

The last chapter is devoted to the description and treatment of faulty attitude or posture. This subject is well handled, but it would seem that a little more space might well have been given to this important problem.

REXFORD L. DIVELEY, M.D.

ABSTRACTS OF CURRENT LITERATURE

INDEX TO ABSTRACTS IN THIS ISSUE

ALLISON, NATHANIEL. The Surgery of the Knee Joint 171, 172

BAUMGARTNER, E. A., and THOMAS, W. S. Aneurysm of the Splenic Artery..... 138

BEELER, R. C., and MERTZ, H. O. The Necessity of Close Co-operation between Roentgenologist and Urologist in the Diagnosis of Double Kidney..... 103

BERTHOLD, R. Efficacy of Protective Substances Against X-rays..... 172

BETTMANN, H. W. Diagnostic Errors Leading to Uncalled for Appendectomy..165, 166

BOWDITCH, HENRY I., LEONARD, RALPH D., and SMITH, LAWRENCE W. Studies of the Roentgen-ray Treatment of Whooping Cough 164

BRENZINGER, M. A New Instrument for Changing Electroscopes, Iontoquantimeters and Similar Apparatus..... 167

CASE, J. T. (*with* WARTHIN, A. S.)..... 115

COOKE, W. E. Fibrosis of the Lungs Due to the Inhalation of Asbestos Dust.....158, 159

DAVIS, D. J. (*with* PILOT, ISADORE)..... 165

DERBY, GEORGE S. X-ray and Radium in the Non-malignant Diseases of the Eye.. 164

DRESSER, R. (*with* HOLMES, G.W.)..... 164

EDEIKEN, LOUIS. The X-ray as an Aid in the Differential Diagnosis of Abdominal and Chest Conditions 165

FERBER, JULIUS. Roentgenologic Evidence of Mitral Disease 100

FETTEROLF, GEORGE. Reaction of the Paratonsillar Tissues to Tonsillectomy. A Study in the Etiology of Post-tonsillectomy Pulmonary Abscess 166, 167

FORSSELL, GOSTA. Experiences in the Permanency of Radiological Cure in Cancer 170, 171

FOWLER, W. FRANK. Co-existent Nephrolithiasis and Ureterolithiasis on Opposite Sides 159

GEMMILL, W. F. Emphysematous Gangrene, with Report of Cases..... 168

GILES, ROY G. Short Wave Length X-rays in the Treatment of Non-malignant Uterine Conditions 161

GREBE, L., and MARTIUS, H. Comparative Measurements of the Quantity of Roentgen Rays Necessary to Produce the Skin Erythema 163, 164

HARRINGTON, CHARLES D. Radium Treatment for Cancer of the Upper End of the Esophagus 167

HERENDEEN, R. E. The Roentgen Ray in the Treatment of Giant-cell Tumors..... 158

HOLMES, G. W., and DRESSER, R. Some Observations on Short Wave Roentgen Therapy 164

JONES, JOHN F. X., and PFAHLER, GEORGE E. Head Injuries 92

JUNGLING, O. Concerning the Question of Dosage in Relation to Absorbed Energy in X-ray Therapy..... 167

KREUSCHER, PHILIP H. Knee-joint Injuries and Their Management..... 169

LATTIN, B. (*with* PERKINS, C. W.)..... 88

LEDDY, E. T. (*with* WEATHERWAX, J. L.)... 138

LEITCH, ARCHIBALD. Gallstones and Cancer of the Gall Bladder.....169, 170

LELAND, GEORGE A. Massive Dose Radium Treatment in Carcinoma of Cervix Uteri 159, 160

LEONARD, RALPH D. (*with* BOWDITCH, HENRY I., and SMITH, LAWRENCE W.)..... 164

LEVIN, OSCAR L. Treatment of Acne Vulgaris 162, 163

LEWIS, DEAN. Primary Giant Cell Tumors of the Vertebræ.....160, 161

MARTIUS, H. (*with* GREBE, L.).....163, 164

MATONI, H. H. Dependence of Strength of Biological Reaction on Intensity of Roentgen Rays of Equal Doses.....164, 165
McCULLOUGH, JOHN F. High Voltage X-rays in Cancer..... 117
MEANS, J. H. (*with* STARR, PAUL, WALCOTT, HENRY P., and SEGALL, HAROLD N.).... 165
MERTZ, H. O. (*with* BEELER, R. C.)..... 103
MORISSEY, JOHN H., and SMITH, FREDERICK W. Symptomatology and Diagnosis of Polycystic Kidney 106
NORSWORTHY, O. L. Treatment of Cancer of the Lower Lip.....157, 158
OVERGAARD, A. P. Roentgenological Findings of the Right Upper Quadrant of the Abdomen 167, 168
PERKINS, C. W., and LATTIN, B. Differential Diagnosis of Enlarged Heart and Pericarditis with Effusion..... 88
PFAHLER, GEORGE E. (*with* JONES, JOHN F. X.) 92
PFAHLER, GEORGE E., and WIDMANN, B. P. The Relation of Blood Groups to Malignant Disease and the Influence of Radiotherapy 110
PHEMISTER, D. B. Changes in the Articular Surfaces in Tuberculous and in Pyogenic Infections of Joints..... 158
PILOT, ISADORE, and DAVIS, D. J. Studies in Fusiform Bacilli and Spirochetes..... 165
PORTMANN, U. V. The New Deep X-ray Therapy and its Application in Treatment of Malignancy..... 168
REGAUD, CLAUDE. Some Biological Aspects of the Radiation Therapy of Cancer.... 157
RUBIN, H. H. Endocrine Radiation as a Means of Improving the Quality and Power of the Singing Voice..... 121
SCHMIDT, W. H. Indications for Radium and Other Methods of Treatment in Cancer 163
SCOTT, CLIFTON R. Bone Lesions of Congenital Syphilis 156, 157
SCOTT, C. R. Osteopsathyrosis (Osteogenesis Imperfecta) 161, 162
SEGALL, HAROLD N. (*with* STARR, PAUL, WALCOTT, HENRY P., and MEANS, J. H.). 165
SHICHIDA, T. The Effects of X-rays on Liver or Spleen to Stop Hemorrhage.... 157
SISTRUNK, WALTER E. Radiation in the Female Breast before and after Operation.. 172
SMITH, CLINTON K. Lesions of the Ureter, with Special Reference to Obstruction and Infection 168
SMITH, FREDERICK W. (*with* MORISSEY, JOHN H.) 106
SMITH, LAWRENCE W. (*with* BOWDITCH, HENRY I., and LEONARD, RALPH D.).... 164
SMITH, L. A. Roentgen Therapy of Sinus and Intracranial Newgrowths..... 124
STARR, PAUL, WALCOTT, HENRY P., SEGALL, HAROLD N., and MEANS, J. H. The Effect of Iodin in Exophthalmic Goiter..... 165
STRAUSS, O. The Influence of Roentgen Rays on Endocellular and Metabolic Activities 168, 169
SYME, W. S. The Sphenoidal Sinus in Relation to the Optic Nerve..... 162
THOMAS, W. S. (*with* BAUMGARTNER, E. A.) 138
TUFFIER, THEODORE. Transposition of the Ovary with its Vasular Pedicle into the Uterus after Salpingectomy..... 171
WALCOTT, HENRY P. (*with* STARR, PAUL, SEGALL, HAROLD N., and MEANS, J. H.).. 165
WARTHIN, A. S., and CASE, J. T. The Phagocytosis of Nuclear Material (Chromatin) by the Reticulo-endothelial System, the Kupffer Cells in Particular, after Intensive Roentgen Irradiation in a Case of Primary Abdominal Lymphosarcoma. 115
WEATHERWAX, J. L., and LEDDY, E. T. Further Studies of Ionization Measurements of Roentgen-ray Intensity..... 138
WIDMANN, B. P. (*with* PFAHLER, GEO. E.). 110

Congenital bone syphilis.—Congenital bone syphilis is fairly frequent but appears in a number of different forms. It is the purpose of this paper to discuss some of these fairly constant diagnostic features of congenital bone syphilis.

For practical consideration the lesions of syphilis occurring in childhood may be considered in two classes or types: those occurring early, or infantile, and those occurring later, or syphilis tarda.

In the infantile type, long bones are affected, especially near the epiphysis; the involvement may be endochondral, endosteal or periosteal. Retarded ossification and dislocation of the epiphysis have long been known. Little has been added since the description of Wegner in 1870,—Wegner's osteochondritis, or epiphysitis. The long bones are the usual sites of the lesions, but flat bones such as the scapula, ilium and ribs, where there is endochondral growth of bone, are often affected. The most important changes seem to take place at the epiphyseal line, especially on the diaphyseal side. The normal sharp-cut diaphyseal end of the bone becomes widened—there are irregular areas of sclerosis on the bone, which, as the disease progresses, become serrated, or saw-toothed, in appearance. Still later, degenerative changes occur, resulting in rather curious "punched out" or circinated areas of destruction. There is definite periosteal irritation. The epiphysis apparently is not involved, and, except in very rare instances, is not dislocated. The condition is attended clinically by "pseudo-paralysis," de-

scribed by Parrot. It may be taken as an axiom that loss of power in a limb of an infant under six months of age is due to syphilis. Periosteal involvements, although usually relatively slight, may, when the lesion is present in certain localities, become the predominating lesion. In syphilitic dactylitis the periosteal reaction is most pronounced, the raised periosteum surrounding the shaft of the bone like a cloak, without evidence of bone destruction. This lesion occurs most frequently under one year of age. The lesion is usually multiple.

Bone lesions of syphilis tarda usually take the form of osteitis, periostitis or gumma. These most frequently occur between the ages of five and fourteen. The same lesion of the diaphyseal end as described in the infantile type may occur. Usually, however, the tibia is the bone involved, resulting in the so-called "scabbard tibia." The bowing of the bone is only apparent, due to the piling up of the new bone formed from periosteal irritation—not true bending of the bone. Gummata may occur in the later stage of congenital syphilis. Definite circinate areas of destruction, surrounded by sclerotic bone, are their typical appearance. The skull is frequently involved by this type of lesion.

L. R. SANTE, M.D.

Bone Lesions of Congenital Syphilis. Clifton R. Scott. Am. Jour. Dis. Child., July, 1924, p. 38.

Studies in coagulation.—This study is an attempt to confirm or refute Stephan's claim that irradiating the spleen increases coagulation, and that the spleen is the central organ for coagulation.

Thirteen cases were examined, six of which had X-ray applications to the spleen and ten to the liver. Technic was to apply 2 to 3 ma. with gas tube for 5 to 7 minutes, filtered through 3 mm. Al. (distance from target to skin not stated).

It was found that the application of X-rays over the spleen markedly promoted coagulation, as Stephan observed, but the effect in stopping hemorrhage was doubtful. When application is made over the liver, coagulation is markedly accelerated and coagulum is of better character, while the effect on stopping hemorrhage was remarkable.

A series of animal experiments led to the conclusion that there is no central organ of coagulation, but that the liver is more closely related to coagulation than is the spleen, and that other organs and tissues have some influence in promoting coagulation. The proper selection of dosage is important, as an overdose disturbs the coagulation. The author has found a hard case tube preferable to the Coolidge tube. Radiation should be applied over the liver five or ten hours before operation in a hemorrhagic diathetic patient.

W. W. WATKINS, M.D.

The Effects of X-rays on Liver or Spleen to Stop Hemorrhage. T. Shichida. Japan Medical World, May 15, 1924, p. 115.

Radiation treatment of cancer.—The author endeavors to show that the phenomena caused in the testicles of mammals by the X- and gamma rays are parallel to those which are taking place in an irradiated cancer. As the radiation becomes more penetrating, the diffuse necrotizing effects diminish, then practically disappear, and finally only the selective effects remain, which are manifested in the most radio-sensitive cells. In diffuse caustic radiotherapy the selective effects will exist, but they are masked by the diffuse caustic action. The selectivity of biologic action and the penetrating power are two properties of radiation which run together in the same sense. Accordingly the radiation treatment of cancer should utilize the selective action of the rays instead of their diffuse caustic effect, and the required selective action calls for more penetrating X-rays, increased voltages and higher potential tubes. The decreasing radio-susceptibility of cancer cells treated by small ineffective and successive doses, imposes the necessity of the single continuous or discontinuous treatment. The chronological distribution of this single complete treatment must be adapted to the life peculiarities of the cancerous tissue. Generally the treatment is more effective if continuous and extended over six to ten days. This is particularly true for the epidermoid squamous-cell cancers.

J. D. CAMP, M.D.

Some Biological Aspects of the Radiation Therapy of Cancer. Claude Regaud. Am. Jour. Roentgenol. and Rad. Ther., Aug., 1924, p. 97.

Lower lip cancer.—During twenty years of surgical experience, and up until three years ago, the author advocated pre-operative radiation and block dissection of neck glands in hopeful cases of lower lip cancer. He no longer uses sharp dissection surgery, but relies almost entirely on radium, in exceptional cases using electrocoagulation as an adjuvant. He does not advocate X-ray, and says that it is not efficient. He quotes Broders, who reported that out of 537 cases of squamous cell epithelioma of the lip operated on at the Mayo Clinic and in whom more than one group of cervical nodes was involved, none were alive.

The author's technic is to divide the area of the corner of mouth, lower lip and submental

and submaxillary spaces into squares of one inch. Apply 50 mg. of radium at one inch distance over each area for four hours, repeating this two to four times, reversing the axis of the radium applicator each time. Two weeks later completely surround the primary lesion with embedded radium in 10 mg. needles 8 mm. apart, to remain two to eight hours. If advisable, mark out three other areas over course of cervical and jugular nodes and irradiate to skin tolerance at distance of one inch. If glands are enlarged, embed needles in them about two weeks later.

W. W. WATKINS, M.D.

Treatment of Cancer of the Lower Lip. O. L. Norsworthy. Texas St. Jour. of Medicine, July, 1924, p. 184.

Tuberculous and pyogenic arthritis.—In pyogenic arthritis, articular cartilage is killed and destroyed primarily and most extensively at the points of contact and pressure of opposing articular surfaces. In tuberculous arthritis, if the joint presents both free and contacted surfaces, the articular cartilage is killed and destroyed first by the direct attack of granulation tissue along the free surfaces, and the cartilage is best protected in the regions of contact and greatest pressure in the joint. In tuberculous arthritis, at the points of contact and pressure the attack of granulations on the cartilage is usually from beneath, resulting in absorption of bony cortex and detachment and thinning of the cartilage.

Proteolytic ferments are present in pyogenic arthritis, and assist in the digestion of dead cartilage. They are absent in tuberculous arthritis and dead cartilage which has been detached or which is located on sequestra may stand for months or years without being destroyed.

Secondary invasion of the bone, resulting in sequestra bordering on the articular surface, is rare in pyogenic arthritis, but common as a late occurrence in tuberculous arthritis. In tuberculosis the points of contact and pressure are apt to be the seats of bony invasion, and the invasion is often bilateral, producing the picture of "kissing sequestra."

The roentgenographic pictures of both diseases vary considerably, but, in general, evidences of disappearance of cartilage and cortex first at the points of contact and pressure suggest pyogenic arthritis, while evidences of their preservation longest in these regions and of disappearance in unapposed regions are indicative of tuberculous arthritis.

J. D. CAMP, M.D.

Changes in the Articular Surfaces in Tuberculous and in Pyogenic Infections of Joints. D. B. Phemister. Am. Jour. Roentgenol. and Rad. Ther., July, 1924, p. 1.

Technic for tumors.—The author divided the cases referred for treatment into three groups: Group 1 consisted of cases in which no operation had been performed; Group 2 consisted of cases referred for treatment on account of recurrence following operation; Group 3 consisted of those cases referred to prevent recurrence after operation.

Both low and high voltage radiation was employed, the selection depending upon the size, location and depth of the tumor. The majority were treated with low voltage, using 140 KV., 4–5 ma., 4–5 mm. filter, 12–15 inch distance, and a time factor of 15–25 minutes. Two to four areas were radiated at 3- or 4-day intervals. The high voltage technic consisted of giving 200 KV., 5 ma., through 0.5 mm. copper filter, at a distance of 50 cm. for 60–80 minutes. One to three areas were given, depending on the case. It is also believed that the roentgen ray has given better results than the radium pack.

Films made from one to two months after treatment revealed in almost every case, the same reaction, which consists in rapid enlargement of the tumor, with expansion of the cortex and thinning of the bony capsule. The skin is reddened, and soft or edematous; later these subside and a roentgenogram reveals a return of the outline of the tumor, with evidence of bone production or calcification in its capsule. The function of the part returns, pain disappears and the tumor feels firm and hard. A film at this time will show increased density and calcification and the entire mass may appear to be converted into solid bone. These changes were uniformly present in cases of Group 1. In Group 2 the prompt relief from pain, and the clearing up of an infection with return to function were notable features, but the reaction to radiation, as described, was in some instances slight and calcification of the tumor slow to take place. Recurrences are less amenable to treatment and resist heavy treatment. In Group 3, no recurrence was found, but a shell-like cavity persisted and very little attempt at filling in of the tumor cavity could be demonstrated, in some instances years after the operation.

J. D. CAMP, M.D.

The Roentgen Ray in the Treatment of Giant-cell Tumors. R. E. Herendeen. Am. Jour. Roentgenol. and Rad. Ther., Aug., 1924, p. 117.

Lung fibrosis due to asbestos dust.—The author claims his case to be the first in English medical literature to be definitely proved.[1] J. M. Beattie has shown that asbestos

[1]The evidence presented by the author does not seem to be entirely convincing. The fibrosis in the case need not necessarily have been the result of the inhalation of asbestos particles, since the tuberculosis alone could readily have produced it.

dust causes fibrosis in guinea pigs. Asbestos contains, amongst other products, calcium and magnesium silicates and 40 per cent of SiO_2, silica. The silica fiber is quite translucent except at the fractured ends, where some change takes place, the fiber becoming blackened and fragmented. Asbestos dust, no matter from what part of the process it is collected, contains these particles in large amounts.

The case reported is that of a woman, aged 33 years, who had worked in asbestos factories for twenty years. An X-ray plate showed extensive fibrosis, more marked in the right lung. On macroscopic examination, the pleura was found to be thickened, and dense adhesions to the chest wall and to the pericardium were present. On section the lungs were found to be fibrosed and to a large extent airless, the lung tissue being replaced by fibrous tissue. There were tuberculous cavities in the apices and scattered areas of caseation throughout both lungs. In the caseous areas and in the fibrotic parts, particles of mineral matter were demonstrable microscopically. These particles were of various shapes, but the large majority had sharp angles. They varied in size from 3 to 393.6 microns in length. A microphotographic illustration of the asbestos particles in the lung is given. The lymphatic glands showed periadenitis and fibrosis. The bronchi were dilated, the lining epithelium had disappeared, and there was extensive peribronchial fibrosis.

SOLOMON FINEMAN, M.D.

Fibrosis of the Lungs Due to the Inhalation of Asbestos Dust. W. E. Cooke. Brit. Med. Jour., July 25, 1924, p. 147.

Kidney examinations. — Careful examination of the kidneys is essential in all cases of ureteral stone. Frequently redevelopment of stones suggests possibility of missing them in the first place. In a series of 484 operations for renal calculi the co-existence of a stone in the kidney and another in the opposite ureter was noted only three times. A stone which blocks the ureter causes infection and loss of function in the kidney above it. The obstruction must be removed within ten days if the integrity of the kidney is to be preserved. Digital exploration of the kidney pelvis and fluoroscopy with the kidney delivered from the incision have minimized the likelihood of overlooking renal calculi.

L. R. SANTE, M.D.

Co-existent Nephrolithiasis and Ureterolithiasis on Opposite Sides. W. Frank Fowler. Ann. Surg., July, 1924, p. 62.

Carcinoma of cervix uteri.—At the Collis P. Huntington Memorial Hospital, small fractional doses of screened gamma radiation were formerly used for treating carcinoma of the cervix. The applications, ranging as high as 5,000 mc.-hr. at a treatment, were made directly into or against the cratered cervix and were repeated at intervals of from three to six weeks. After three or four treatments there were always much reactive edema, local tenderness and some contracture at the apex of the vagina—outstanding disadvantages which interfered with further treatment by creating difficulties for the attending radiologist and hardships for the patient.

Since July 1, 1920, however, single massive doses of unscreened radium emanation have been employed. This treatment yields the maximal curative action of radium because of the immediate contact of this with the malignant tissues. It is effective for eradicating carcinoma of the cervix, and is quicker and less debilitating to the patient than intermittent screened gamma irradiation, which should be employed only for palliative surface healing. In the most favorable cases, the dosage averages 5,000 mc.-hr. The cases are treated—always under nitrous oxid or nitrous oxid and ether anesthesia—by implanting emanation seeds totaling 18 to 19 mc. in the cervical tissue or by inserting emanation tubes enclosed in steel jackets, totaling 300 to 800 mc., for from 3 to 8 hours. The larger emanation seeds (up to 12 mc.) do not destroy tissue over a wider area than the smaller seeds, but do produce more extensive destruction at the site of implantation. Since such concentrated radiation may cause sloughing of normal tissue —possibly also penetration of the rectovaginal or vesicovaginal septum—the larger seeds have been gradually abandoned in favor of seeds of 1.5 or 2 mc. Of steel-encased emanation tubes, however, it is best to employ the largest available sizes, because it is difficult to place accurately more than five or six bare tubes within the uterocervical canal and it is impossible to withdraw a larger number of tubes from the uterus without encountering the danger of having one or several become imbedded in the tissue at or just above the internal os. Failure to retrieve all of the implanted needles naturally entails overdosage. Repetition of heavy unscreened treatment is not often effective and may produce debilitating reactive symptoms. After six months, however, it may prove valuable as a palliative procedure for bleeding vaginal disease. The use of the cautery before or during radium treatment is not advised, since it necessitates longer hospitalization and prolonged anesthetization, increases the danger of phlebitis and pulmonary complications, and distorts the

tissues so that accurate application of radium becomes difficult or impossible.

Not every patient should receive the maximal dose, which necessarily causes much reaction. Individual factors, including age, general condition, cachexia and degree of invalidism, must be considered. Where there is extensive involvement of the broad ligaments with wide fixation or extreme vaginal disease, from one-third to two-thirds of the maximal dose may be indicated. The reaction to heavy irradiation, consisting of pelvic pain, vesical and rectal irritation and general malaise, varies greatly in different patients. The pains may be very distressing and prolonged, possibly owing to the presence of scar tissue that resists the reactive swelling and produces tension, with its consequent pain. The rectal and colonic reaction is usually characterized by constipation with some tenesmus and passage of mucus. In a few instances, transitory ulcerative proctitis or colitis—solitary and large near the cervix, or small and diffuse higher up—is observed. The vesical symptoms can usually be explained by infiltration of disease toward the base of the bladder, and, secondarily, by irritation from reactive swelling. The formation of a fistula is a surprisingly infrequent occurrence after heavy doses of radium emanation.

Re-examination of patients in three months after treatment shows the cervical and vaginal lesion completely or almost completely destroyed, with some evidence of fibrinous slough. Beyond the limits of the disease there is no reaction other than edema of the vagina, the apex of which shows evidence of contracture. By rectal palpation, it is always possible to detect considerable reactive edema, with enlargement of the uterocervical segment and thickening of the broad ligaments. There are no burns such as are noted after repeated gamma irradiations. In another three months, the cervix or its remnants will be healed, leathery and movable in favorable cases. The uterocervical segment and broad ligaments will be shrunken. The general condition, strength and weight will have improved. Unlike the cases treated by repeated screened gamma irradiation, the cervix and uterus are practically normal, the malignant lesion having evidently been destroyed. The patients are psychically encouraged because no further treatment is contemplated. In less favorable cases there may be active disease at the apex of the vagina. The uterocervical segment will be enlarged and the broad ligaments thick and hard. The general condition may be affected very little.

A series of 165 cases treated between July 1, 1920, and July 1, 1921, warrants certain critical deductions because the empiric three-year period of observation has elapsed. There are included 126 cases of primary carcinoma (Class 1, American College of Surgeons' classification), 33 cases of recurrent carcinoma following complete hysterectomy (Classes 2 and 3), and 6 cases of cervical carcinoma following supracervical hysterectomy (Class 4).

The results of treatment with radium emanation in massive doses, not supplemented by external radium or roentgen irradiation, are summarized in a table:

TABLE OF RESULTS

Carcinoma Cervix Uteri—July 1, 1920, to July 1, 1921

Class	Cases	Traced	Well	Alive With Disease	Dead	Percent Well	
1A	4	4	3	1	0	75.0	45.0
1B	16	14	6	0	8	37.5	
1C	57	54	5	2	47	8.7	
1D	49	44	2	1	41	2.0	
Total	126	116	16	4	96	12.6	
2B	7	6	4	0	2	57.1	
2C	11	9	0	0	9	0.0	
2D	4	4	0	0	4	0.0	
Total	22	19	4	0	15	19.1	12.1
3C	1	0	0	0	0	0.0	
3D	10	9	0	0	9	0.0	
Total	11	9	0	0	9	0.0	
4A	2	1	1	0	0	50.0	
4B	1	0	0	0	0	0.0	
4C	2	2	0	0	2	0.0	
4D	1	0	0	0	0	0.0	
Total	6	3	1	0	2	16.6	
Grand Total	165	147	21	4	122	12.7	

JOSEPH MUIR, M.D.

Massive Dose Radium Treatment in Carcinoma of Cervix Uteri. George A. Leland. Am. Jour. Roentgenol. and Rad. Ther., Oct., 1924, p 373.

Vertebral tumors.—The tumors that have been considered have some definite peculiarities. In none of these have metastatic growths been observed. Local recurrences have occurred in several, but these have been controlled rather easily by a number of different measures. In Manheimer's case the importance of atoxyl in the treatment is emphasized. In several of the cases Coley's toxins were administered. The roentgen ray and radium have been used in other cases. Spontaneous cessation of growth occurred in the case observed by Schumann unless partial excision may be considered to have affected the growth. The tumor was, however, increasing rapidly in size when the patient left the

hospital, without any evidence of cessation in growth. Recovery after partial removal or no attempt at removal has been noted in thirteen of the seventeen cases. In none of these has an attempt at complete removal been made, either because of the possibility of injuring the cord or because of extension of the growth into inaccessible parts.

Ossification, occurring relatively frequently in these lesions, would indicate that they differ in some respects from central giant cell tumors occurring in long bones, although repair may occur in these following curettage, but when this procedure is attempted by far the greater part of the tumor is removed. Ossification occurs in bone cysts, but, judging from the description of the histologic findings in those cases in which ossification occurred, it seems certain that the lesion was a giant cell tumor.

Because of their clinical behavior, some doubt is raised as to the neoplastic character of some of these growths which are regarded by a few pathologists as reactive tissue growths or attempts at repair following trauma, in which there is formed excessive granulation tissue.

Lubarsch and Konjetzny especially have emphasized that many of these lesions represent a reactive tissue growth following trauma. Konjetzny's conclusions are confirmed by the experimental work of Bajardi, Haasler and Enderlen. Following a hemorrhage into the marrow, the supporting tissue of the marrow proliferates to form a very cellular zone about the hemorrhage. This may form fibrous tissue to surround the hemorrhage, or invade it, transforming the coagulum into a scar. In other cases, the tissue, forming as the result of a hemorrhage due to trauma, may continue to grow until tissue is formed similar to that of a giant cell tumor. Such granulation tissue containing giant cells is found in pseudarthroses, delayed callus formation and Köhler's disease. Such reactive tissue growths may resemble histologically a giant cell sarcoma, when biologically it should be regarded as a chronic reparative process. This excessive formation of reparative tissue occurring under certain circumstances may be compared to the keloid of the skin.

The tissue removed from the patient in the case that the author reported resembles histologically that of a giant cell tumor. The history following operation, as well as the diversity of opinion that seems to exist regarding its exact nature, suggests that the lesion may represent some chronic resorptive process with an excessive formation of granulation tissue, which is not a tumor in the strict sense of the word.

This group of cases raises some doubts as to the exact nature of many of the so-called giant cell tumors.

W. W. WASSON, M.D.

Primary Giant Cell Tumors of the Vertebræ. Dean Lewis. Jour. A. M. A., Oct. 18, 1924, p. 1224.

Technic for uterine conditions.—Uterine fibromyoma is the most common non-malignant neoplasm found in the human body. Radiation, from being used only where surgery was contra-indicated, is now the treatment of choice for fibromyoma, in the hands of many of the world's leading gynecologists. With the advent of short wave length X-ray technic, the objections to radiation treatment of fibroids are becoming fewer. The popular argument against radiation—that fibroids become malignant—has little basis in fact, and the danger of this is negligible, and even if true, radiation would be the treatment for the malignancy.

The best time to administer radiation for fibroids is immediately after menstruation, because the graafian follicles are then most sensitive. The author's technic is 200 K.V., 50 cm. focal skin distance, 0.5 to 1 mm. copper filter, which delivers 40 per cent of the erythema skin dose at 10 cm. below the surface; 520 ma. min. is an erythemic dose, and two exposures are given anteriorly and two posteriorly, each being one-half erythemic dose. Large fields are radiated, the desire being to affect both ovaries and tumors.

The author does not limit the treatment to patients approaching the menopause, but applies it to young women, with due care and judgment, and has not found the size of the tumor to be a contra-indication.

W. W. WATKINS, M.D.

Short Wave Length X-rays in the Treatment of Non-malignant Uterine Conditions. Roy G. Giles. Texas St. Jour. of Med., Aug., 1924, p. 242.

Osteopsathyrosis.[1]—Osteopsathyrosis is a rare systemic disease of the bones, probably congenital in origin, and characterized by a deficient and imperfect bony development, associated with multiple spontaneous fractures. The etiology is some disturbance of bone metabolism which affects the entire osseous system and occurs during fetal life.

The primary growth in length is approximately normal and the epiphyseal line is usually sharply cut and straight. The cortex is very thin and medullary space unusually wide, giving the

[1] The author does not mention the changes in the skull, which are quite characteristic, and has apparently overlooked the excellent monograph on the subject by Knaggs.—*Abstractor.*

bones an unusual delicacy and slenderness. The primary pathological changes are the same throughout the entire osseous system, but are best observed in the long pipe bones of the extremities. Marked deformities of almost every type may be seen, due to the multiple fractures and bending of the bones.

On section the bone appears soft and friable, although the lime content may appear normal. The epiphyses are normal, although the proliferative zone of cartilage appears somewhat narrow and bone deposition much decreased. Large marrow spaces replace the normal Haversian system, and there is a marked increase in the medullary substance over spongiosa. Osteoclasts are markedly increased and osteoblasts markedly decreased. No cysts are seen, as is sometimes the case in osteomalacia, and the absorbed bony tissue is not replaced by connective tissue as in osteomalacia.

The roentgenographic appearance is so characteristic and typical that it should not be confused with any other disease. According to Locke, there is seen (1) a high degree of osteoporosis uniformly affecting the entire skeleton, the variations in density giving a mottled appearance; (2) marked deformity of the long bones of the extremities, usually of an angular type and due to evident fractures, rarely, also, some actual bowing; (3) apparent normal size and shape of bones except as altered by fractures and callus formation; (4) often excessive callus formation with variable degree of calcification; (5) the epiphyseal line is straight, cartilage very thin; (6) a very faint shadow is given by all the bones, frequently scarcely more dense than the surrounding soft parts; (7) the cortex is thin, irregular and deficient in lime salts; (8) the spongiosa of both epiphyses and diaphyses is extremely faint, with entire absence of all normal markings; (9) the medullary cavity is very irregular in outline and appears dilated. The disease which causes the most confusion in diagnosis, due to extreme fragility of the bones in infancy, is rickets in an advanced form. However, rickets, as far as known, is not a congenital disease and likewise gives a fairly characteristic picture with marked flaring and lipping of the epiphyseal end of the diaphysis, periosteal thickening, regular bowing and heavy repair on the concave side of the deformed bone. Multiple fractures may occur in rickets but are usually not marked, are not periosteal in type and show poor callus formation. Repeated roentgenograms following intensive treatment in rickets show calcium deposition and repair to take place very rapidly.

The general prognosis in cases of osteopsathyrosis is extremely bad. The majority of children are stillborn or die soon after birth. The general consensus of opinion regarding treatment is that it should follow the same line as that of rickets.

J. D. CAMP, M.D.

Osteopsathyrosis (Osteogenesis Imperfecta). C. R. Scott. Am. Jour. Roentgenol. and Rad. Ther., Sept., 1924, p. 237.

Sphenoidal sinus disease.—The diagnosis of sphenoidal sinus disease is not always easy. Clinical signs are much more important than X-ray examination, but even clinical signs are occasionally misleading, because at the time of examination they may not be manifest. It follows, therefore, that one is justified in opening up the sphenoidal sinus at the request of the ophthalmologist, even if definite clinical signs are absent, and certainly without reference to the X-ray findings. This is another way of stating that in certain circumstances optic neuritis is a clinical sign of sphenoidal sinus disease. It is in those cases where the changes in the sinus lining membrane are not of a gross nature that optic neuritis seems more likely to arise.

SOLOMON FINEMAN, M.D.

The Sphenoidal Sinus in Relation to the Optic Nerve. W. S. Syme. Jour. of Laryngol. and Otol., July, 1924, p. 375.

Technic for acne vulgaris.—After brief discussion of the constitutional treatment, the author emphasizes the X-ray therapy, which is the object of the paper. The X-ray marks a memorable advance in the treatment of acne vulgaris. At the present time, it is possible to tell patients that a cure can be accomplished in 98 per cent of cases within three or four months. The technic of X-ray application consists in the administration of fractional doses of X-ray. With patient recumbent and face turned to one side, the scalp, eyes, ears and eyebrows are covered with leadfoil and chest and neck with lead rubber. Tube is inclined so that the anode is at right angles to a line drawn through the outer part of the zygoma, skin distance usually being eight inches. A dose of one-quarter of skin unit of unfiltered ray is administered to each side and one-eighth of skin unit to middle of the face; this last dose should be given even in the absence of lesions in this area, to provide against future development. One-quarter skin unit is given to any other affected area. Exposures are repeated weekly for twelve to sixteen weeks. There may be a temporary aggravation of symptoms, but this will subside. No effect may be noted, at times, until after the eighth week. Usually no more than sixteen treatments are necessary, but in rare cases more. If skin becomes dry or evidence of atrophy occurs, postpone treatments.

Best results are secured in the indurated type of acne and failures in the punctate type. Patients should be warned against the use of any form of irritant on the skin, such as alcohol, witch hazel, tar, sulphur, etc., and if they are found to have been used, the X-rays should not be administered subsequently for two weeks. Mild soaps, zinc oxide ointment or calamine lotion may be applied. Search should be made for any constitutional disorder and this corrected in order to obtain prompt cure and prevent relapses.

W. W. WATKINS, M.D.

Treatment of Acne Vulgaris. Oscar L. Levin. Med. Jour. and Rec., Dermatology Supp., June 4, 1924, p. cxxxvi.

Cancer treatment.—In addition to careful attention to the patient's physical condition, there are four means of attacking cancer, *i. e.*, surgery, radium, roentgen radiation, and the electrothermic method. It is impossible to say which of these is the foremost as each has its own special indication and use and frequently one must be made to supplement the other.

Surgery still has its field in many internal and inaccessible growths, especially in the gastro-intestinal tract. It is also necessary to expose certain neoplasms so that they may be more effectually treated by one of the other agents, as in cancer of the bladder and prostate. Frequently it is advisable to remove surgically the gross mass, the operation preceded and followed by suitable radiation, as in certain cases of cancer of the breast. Growths which are so located that radiation would damage important structures in close proximity, such as the adrenals and pancreas, are better treated surgically.

Radium is the method of choice in cancer of the cervix, and results, even in advanced cases, justify its selection over any other method. All tumors of lymphatic tissue, if they are accessible, are amenable and respond regularly. In carcinoma of the breast, radium element buried in the mass greatly aids the effects of roentgen radiation, and hastens the destruction of the growth. In this event roentgen radiation should always be used in combination with radium, as its effective radiation does not extend far enough to take care of the metastases in the lymphatics of the mediastinum and axilla. Radium is also indicated in cancer of the prostate and bladder after surgical exposure by the suprapubic method. One of the most effective uses of radium is in recurrent glioma of the orbit. This tissue is very susceptible to radium, and the use of buried element in needles will cause a complete disappearance of the local lesion.

Roentgen radiation should be employed, particularly when we wish to obtain a widespread effect of radiation in contradistinction to radium, where the effects are concentrated; also where the lesion is situated at a distance from the skin. Its greatest use is probably as an adjunct to other treatment. Careful calculation of the dose is necessary, together with good judgment in selecting the skin area and direction of the dose. The tendency seems to be to divide the dose, giving consideration to the patient as well as to the disease. The glandular area in cancer of the cervix, rectum, bladder and prostate must receive deep roentgen therapy. Any deep-seated and inaccessible growth which is not associated with vital glandular structure, such as the adrenals and pancreas, should be treated with deep penetrating radiation. Metastasis to the lungs and bones yields most readily to roentgen therapy. Sarcoma, because of its large size and rapid metastasis, is best treated with roentgen radiation.

With few exceptions, cancer of the lower lip is destroyed by the electrothermic method, followed with radium to the lymphatic area and glands of the neck. In the mouth the author feels that the electrothermic method is superior to all others. This treatment is only for the local lesion, and the glands, when involved, must be treated with radium or roentgen radiation. Another important use for the electrothermic method is the destruction of indolent slough resulting from radium, which persists and shows slight tendency to clear up. The devitalized tissue, with its indolent base, is destroyed and curetted away and a healthy granulation takes place.

J. D. CAMP, M.D.

Indications for Radium and Other Methods of Treatment in Cancer. W. H. Schmidt. Am. Jour. Roentgenol. and Rad. Ther., Sept., 1924, p. 219.

Exact dosage.—Grebe and Martius measured and compared the roentgen-ray quantity necessary to produce a skin erythema in R-units *i.e.*, the unit recently adopted by the German Roentgen Ray Society as the standard unit for the roentgen-ray dose) on 27 different machines. For this purpose they used a Friedrich horn ionization chamber connected to a Wulf string electroscope. The measurements were made in air and not on the patient.

The authors draw the following conclusions:

The differences in the doses measured were between 1,120 and 285 or relative to the dose used at the Frauenklinik Bonn between 285 per

cent and 66 per cent. The average of all doses determined was 580 R.

These large variations illustrate the fact that the skin reaction is suitable only as a foundation for the dosage if it is measured in an exact physical unit for a standard dose.

It is proposed to design as "practical average erythema dose" a roentgen-ray quantity which corresponds to 600 R.

Interesting and valuable as this contribution to the work in exact dosage is, attention must be called to the fact that the results of these authors do not agree with the erythema doses measured in R-units in this country. The smallest number of R necessary to produce the very first erythema reported in this country is 1,400 for fairly hard rays. Part of this difference may be due to the fact that the authors measured the dose in air and not on the patient. In this way that part of the skin dose due to the rays scattered back from the patient was not determined; this may introduce differences in the measured doses up to about 40 per cent.

OTTO GLASSER, PH.D.

Comparative Measurements of the Quantity of Roentgen Rays Necessary to Produce the Skin Erythema. L. Grebe and H. Martius. Strahlentherapie, 1924, xviii, 2, p. 395.

Non-malignant diseases of the eye.—The author advocates the use of radium and X-ray in vernal catarrh and extra-ocular vascular tumors. He recognizes the advocacy, but without approval, of the use of radium in the following: Pterygium, episcleritis, glaucoma, interstitial keratitis, corneal ulcer, corneal scars, cataract, trichiasis, blastomycosis of the lids, myopia, detachment of the retina, trachoma, tuberculosis, xanthelasma, etc.

W. W. WATKINS, M.D.

X-ray and Radium in the Non-malignant Diseases of the Eye. George S. Derby. Boston Med. and Surg. Jour., July 3, 1924, p. 20.

Technical suggestions.—The authors utilize the lead-lined couch, which they believe has many advantages. The couch encloses all of the high tension circuit, and the lead lining is well grounded, thus affording absolute protection from electrical shock and undesirable scattered radiation. The patient can be placed in position quickly and is not subjected to the discomfort of a heavy covering of leaded rubber. The treatment room is free from noxious gases and odors, and thus radiation sickness is greatly diminished.

Instead of giving a full erythema dose to an area at one sitting, one-half an erythema dose is given and this is repeated every day or every other day until the series is finished. With this method the discomfort to the patient is greatly reduced and the roentgen sickness markedly diminished. The patients also appear to suffer less discomfort when small fields are used, and the authors are inclined to use smaller fields even at a sacrifice of depth dose.

As a general rule, superficial glandular manifestations are treated with the longer wave therapy (4 mm. Al. filtration) and the short waves are used only on mediastinal and abdominal processes. Mediastinal symptoms are in most cases controlled by about one-half an erythema dose over the front and back of the chest, using a large sized field. Because of the reaction, more than a sixth of an erythema dose at one sitting is seldom given when treating a case of Hodgkin's disease over the mediastinum or abdomen.

J. D. CAMP, M.D.

Some Observations on Short Wave Roentgen Therapy. G. W. Holmes and R. Dresser. Am. Jour. Roentgenol. and Rad. Ther., Sept., 1924, p. 209.

Whooping cough.—At the present time the writer's methods of treatment may be summarized as follows: (1) In exposed cases the use of pertussis vaccine may be considered as probably from 85 to 90 per cent efficient in preventing the disease; (2) In active cases the use of the roentgen ray, as outlined by one of the writers (R. D. L.), supplemented by diathermy and medication as indicated, particularly in those cases complicated by bronchopneumonia, gives a valuable weapon in the treatment of the disease.

W. W. WASSON, M.D.

Studies of the Roentgen-ray Treatment of Whooping Cough. Henry I. Bowditch, Ralph D. Leonard and Lawrence W. Smith. Am. Jour. Dis. Child., Sept., 1924, p. 322.

Biological tests.—The careful and elaborate experiments of the author on the influence of measured doses of roentgen rays on germinating beans—*vicea faba equina*—prove the fact that for a difference in radiation intensity applied in the ratio 1:4 (the times correspondingly in the ratio 4:1), the biological effect obtained was not the same in both cases but was stronger for the high intensity applied in a short time.

The conclusion of the author that, on account of these results, the therapeutic doses ought to be applied with the highest possible intensity in a short time must be considered with some skepticism since experience has shown that it is not always advisable to generalize in the treatment

room the experimental results obtained in one special biological test.

OTTO GLASSER, PH.D.

Dependence of the Strength of the Biological Reaction on the Intensity of the Roentgen Rays of Equal Doses. H. H. Matoni. Strahlentherapie, 1924, xviii, 2, p. 375.

X-ray as aid in diagnosis.—The author discusses certain diseased processes in which the lesion is in one location, with the predominating symptoms in another. The chief lesions in which the clarifying influence of the roentgenologist is of supreme importance are:

Pneumonia from acute appendicitis, especially in children. On one of the pediatric services of Mt. Sinai Hospital, there is a standing order that all children in whom acute appendicitis is suspected shall have an X-ray examination of the chest to eliminate pneumonia. The matter can frequently be settled by fluoroscopy.

Empyema from subphrenic abscess, the roentgen pictures in these conditions being totally different.

Traumatic pneumo- or hemopneumothorax from intra-abdominal perforation and hemorrhage. In cases of injury, with shock and contusion, there may be pain, tenderness and rigidity of the upper abdomen from thoracic injury.

Pleurisy from cholecystitis. The pain may be very similar, and fluoroscopic examination may reveal the characteristic findings of pleurisy, while a more detailed examination may determine regarding gall-bladder disease.

Cardiac and aortic lesions from suspected lesions of stomach and duodenum. Cardiac and aortic disease may simulate closely organic lesions of stomach.

Lower esophageal conditions from those in the stomach.

Tumors of liver and spleen from lesions in lower lobes of the lungs.

W. W. WATKINS, M.D.

The X-ray as an Aid in the Differential Diagnosis of Abdominal and Chest Conditions. Louis Edeiken. Med. Jour. and Rec., May 21, 1924, p. 492.

Fusospirochete infection. — Thirty-seven cases of pulmonary infection due to certain anerobes, characterized by abscess formation and gangrene, are reported. The bacteriologic, pathologic, and clinical studies indicate a type of infection which may be classified as a distinct clinical entity. We refer to the process as a fusospirochete pneumonia, but pyogens, particularly streptococci, play an important contributory rôle.

The lesion is largely in the form of simple or multiple abscesses, gangrenous bronchopneumonia or a diffuse form of gangrene. The development of this type of infection depends to a great extent on predisposing factors such as general anesthesia, tonsillectomy, aspiration of foreign bodies, perforating lesions into the trachea and bronchi, infections, especially pneumonia, carcinoma, tuberculosis, and bronchiectasis and circulatory disturbances of various kinds. In a few the lesions develop without evident predisposing causes.

The clinical picture and course is variably influenced, largely by the underlying contributory factors, resistance of the patient, and the extent of the lesion. Probably in all cases the sources of infection relate back to the teeth and tonsils, where the fusiform bacilli and spirochetes and cocci are present in enormous numbers. The prevention of these pulmonary infections, therefore, lies in the proper hygiene of the mouth. Arsenic, particularly neo-arsphenamin, has a definitely therapeutic action on fusospirochete infection. Most favorable results are obtained in the early cases.

W. W. WASSON, M.D.

Studies in Fusiform Bacilli and Spirochetes. Isadore Pilot and D. J. Davis. Arch. Int. Med., Sept. 15, 1924, p. 313.

Iodin for exophthalmic goiter.—Iodin by mouth will produce abrupt remission in most cases of exophthalmic goiter. The remission is often as rapid and as extensive as that following subtotal thyroidectomy. It is believed that iodin is the causal agent of this remission. Iodin alone as now used has not been shown to be sufficient to suppress the disease permanently. After a patient with exophthalmic goiter has been taking iodin, a rapid rise of metabolic rate and increase of toxic symptoms will occur within one or two weeks if the iodin is stopped. In some cases of exophthalmic goiter, iodin has no observable effect.

W. W. WASSON, M.D.

The Effect of Iodin in Exophthalmic Goiter. Paul Starr, Henry P. Walcott, Harold N. Segall and J. H. Means. Arch. Int. Med., Sept. 15, 1924, p. 355.

Appendicitis.—1. Operations for chronic appendicitis do not yet yield a satisfactory proportion of cures, owing to errors in diagnosis.

2. The term "chronic appendicitis" expresses a pathologic rather than a clinical condition.

3. The relapsing form of appendicitis necessitates prompt surgical intervention, and

yields a very large proportion of permanent cures.

4. Aside from the relapsing type, a particular group of symptoms suggests chronic appendicitis, but not with reasonable certainty.

5. Right iliac pain is a most deceptive sign. In from 40 to 50 per cent of the unsuccessful operations, it remains for months or years after the operation.

6. Two-thirds of the failures are in cases that have not been adequately studied before operation.

7. Roentgen-ray examinations are usually not to be depended on for clinical diagnosis, and are often misleading.

8. Urinary disorders are far too often mistaken for appendicitis.

9. In general, too many constitutional disorders are overlooked, and appendectomy often has serious after-results.

W. W. WASSON, M.D.

Diagnostic Errors Leading to Uncalled for Appendectomy. H. W. Bettmann. Jour. A. M. A., Oct. 18, 1924, p. 1216.

Reaction of Paratonsillar Tissues to Tonsillectomy. — Post-tonsillectomy lung abscess was first mentioned by Richardson eleven years ago. Recently, Moore has collected 202 instances from the literature. Among his conclusions are: "The vast majority of cases are of inspiratory origin, because of (*a*) time of development and (*b*) involvement of the lower lobes of the lung in 60 per cent of the cases (right lower, 41 per cent; left lower, 19 per cent), being almost the same relative incidence as in cases of inspired foreign bodies. Blood-stream transmission of infected material, causing pulmonary abscess, occurs but in a relatively small number of cases. Lymphatic extension is a rare mode of infection."

There are three possible modes of extension: by bronchogenic method through inspiration of infected material, saliva, blood, tonsillar crypts, etc.; by the hematogenic method through the dissemination of small thrombi through the circulation; and by the lymphogenic method through the carrying of bacteria by the lymph stream. The author feels that too much attention has been called to the bronchogenic form resulting presumably from the aspiration of material during the operation and points out several facts in favor of the view that this mode of origin cannot be considered as the predominating etiological process. The natural immunity of the air passages from bacterial invasion seen in the breathing of bacteria-infected air at all times and the relatively few cases of either pneumonia or infection following general operation, even where, in many cases, the patients had dirty mouths, is cited. Cutter and Hunt's report of 1,604 operations with seven cases of broncho- and one case of lobar pneumonia as a post-operative complication is quoted. The lobar pneumonia case followed local anesthesia—of the bronchopneumonic cases, four followed anesthesia by gas oxygen method, three by ether method.

In favor of the embolic cause of post-tonsillectomy lung abscess, the writer points out that many arguments advanced to show the aspiration character of the disease may be erroneous. Statements to the effect that lung abscess being most frequent in the right lower lobe almost to the same percentage as foreign bodies found in the lung, are discredited as of any weight by the author, since examination of the literature has disclosed the fact that pulmonary emboli are also most frequent in the lower lobes, a large number occurring on the right side. An analysis of Cutler's cases of pulmonary emboli shows twenty-one located in right lower lobe to nine in the left lower.

With a view of determining the possibilities for the formation of emboli in this region after tonsillectomy, an anatomical study of the plexus of pharyngeal veins was made. Animal experimentals were carried out to determine the actual formation of emboli. The conclusions were:

1. The peritonsillar region as depicted in our specimens constitutes a post-operative field studded with thrombi, which may be either sterile or septic.
2. We believe that as trauma, sepsis and muscular action are the principal factors in the formation and dislodgment of thrombi, the actively muscular pharynx is a particularly favorable region for the dislodgment of such thrombi into the superior caval circulation.
3. We believe that many cases of pulmonary embolism escape notice on account of their small size, their sterile character, and their prompt resolution.
4. It goes without saying that the performance of tonsil operation should be attended with every possible surgical device for promoting asepsis. We suggest, in the furtherance of this principle, that the routine use of needle-carried sutures for tying bleeding vessels be abolished and that surface ties be used instead. The former are never surgically clean and we believe that their use carries with it possibilities of infection of at least the tissues adjacent to them.
5. While realizing the post-tonsillectomy lung complications may at times be of inspiratory origin, we believe that such

origin is not as common as has been thought.

6. While the infected condition of the lymphatic tissue found in our study must cause consideration to be given to a lymphatic origin for lung infections, we consider such origin to be rare.
7. Finally, it is possible that, in view of such studies as the present one, ideas in regard to the capsule of the tonsil may undergo a change. Instead of aiming to remove it, we may decide that it forms too good a bulwark to the peritonsillar tissues to allow of its being taken away. And we believe it to be entirely possible that some day the operation, called by Makuen, "intracapsular tonsillectomy," will be so demanded by the highest ideals of safety that in a perfected form it will be the operation performed by all of us.

L. R. SANTE, M.D.

Reaction of the Paratonsillar Tissues to Tonsillectomy. A Study in the Etiology of Posttonsillectomy Pulmonary Abscess. George Fetterolf. Am. Jour. Med. Sci., Dec., 1923, p. 802.

Relief for esophageal cancer.—Cancer of the esophagus is usually not discovered until it has advanced beyond hope of cure, patients usually not coming for treatment until they are unable to swallow food, pain not being a prominent symptom.

Two advanced cases are reported in whom treatment by radium capsules within the involved area of the esophagus gave marked palliative relief.

W. W. WATKINS, M.D.

Radium Treatment for Cancer of the Upper End of the Esophagus. Charles D. Harrington. Journal-Lancet, June 15, 1924, p. 333.

A new instrument.—This simple and reliable contrivance was constructed and theoretically as well as practically and thoroughly studied at the Dessauer Institute. The abstractor's own experiences with it prompt him to recommend the instrument most highly.

HANS A. JARRE, M.D.

A New Instrument for Charging Electroscopes, Iontoquantimeters and Similar Apparatus. M. Brenzinger (Frankfurt). Strahlentherapie, XVI, No. 1, 1923, p. 155.

Treatment doses.—Jungling calls attention to the fact, well known among all roentgenologists, that besides the local effect of a given X-ray dose at the site of the lesion, the total amount of energy absorbed by the body exerts an important influence on the biological activities of the diseased organism; he determines the amount of energy quantitatively, and designates the quantity of rays which, with a 15 per cent radiation, using a heavy metal filter and producing a S.E.D., from a cone of incidence of 1 g. cm., will be absorbed to a depth of 20 cm. as 100 J (intensity units). In the calculation scattering of rays and quadratic diminution may be disregarded as being uncontrollable and indeterminable.

It is of interest to find out which space dose (Raumdosis) is usually applied in some of the ordinary treatments: a castration dose, according to Seitz and Wintz, requires about 19,200 J; Roentgen-Wertheim, according to Seitz and Wintz, in the course of three months, 86,400-100,800 J; homogenous irradiation of the pelvis from four fields, according to Dessauer, 87,000-134,000 J at one sitting. The discrepancies are quite evident. Furthermore, the conception of a relative space dose is taken up, *e.g.*, the dose in relation to the body weight. It is thus shown how different the results will be with the use of the same dose in the treatment of a tuberculous hip joint in a child from that of an adult.

The work certainly is a valuable addition to our conception of the effects of X-rays.

L. Hahn, Leipzig (No. 12, 1924, p. 371) adds the following technical comments: The diminution of the intensity of the beam of rays is only to a small extent due to absorption, but largely to the scattering of rays. He therefore demands the quantitative determination of the amount of energy entering and leaving the body. By subtracting the latter from the former, he judges the amount of absorbed energy. Jungling is fully aware of the inaccuracy of his method, so that attention need not be called to it. His method, however, seems to satisfactorily serve the purpose for which it is designated.

HANS A. JARRE, M.D.

Concerning the Question of Dosage in Relation to Absorbed Energy in X-ray Therapy. O. Jungling (Tubingen). Muenchener Medizinische Wochenschrift, Feb., 1924, No. 5, p. 123.

Lesions of right upper quadrant of abdomen.—The roentgen-ray examination of the right upper quadrant to-day is definite, practical and necessary in making gastro-intestinal diagnosis. A conservative attitude demands that under no circumstances should a final diagnosis be made on the roentgen-ray findings alone, and the same is true of the converse of this statement. The following lesions are considered, the scheme and conclusions of Carman being followed: gastric ulcer, duodenal ulcer, cancer

of the lower end of stomach and duodenum; gallstones and gall-bladder pathology.

W. W. WATKINS, M.D.

Roentgenological Findings of the Right Upper Quadrant of the Abdomen. A. P. Overgaard. Neb. St. Med. Jour., July, 1924, p. 264.

Emphysematous gangrene. — Cause of emphysematous gangrene is infection with bacillus aerogenes capsulatus. Infections from this organism differ from infections with bacillus of malignant edema.

In many respects the infections are similar, particularly as to crepitation and the peculiar yellowish appearance of the skin. In malignant edema the clinical manifestations begin several days later than we would expect from a gas bacillus infection, and the infections seem to be more superficial.

The bacillus of malignant edema affects the subcutaneous tissues only, the muscles escaping. The disease cannot be cured by amputation or by laying the tissues wide open by multiple incisions. The mortality is practically 100 per cent.

By means of the X-ray air can be demonstrated in gas bacillus infections between the muscle layers before crepitation can be elicited.

SUMMARY

1. Attention is called to the differential diagnosis and prognosis of bacillus aerogenes capsulatus and bacillus edematis maligni infections. Recovery occurred in 50 per cent of the cases suffering from infection with the bacillus welchii.

2. Early diagnosis of the condition is made by means of the X-ray, which shows air spaces in the diseased tissues even before crepitation exists.

3. There is a possibility of communicating the disease by fomites, as the spores seemingly resist the ordinary hospital sterilization of infected articles.

4. The disease is prevalent though heretofore considered rare in civilian life. This misconception is due either to improper diagnosis or to the classification of cases of septicemia.

L. R. SANTE, M.D.

Emphysematous Gangrene, with Report of Cases. W. F. Gemmill. Surg., Gyn. and Obst., May, 1924, p. 650.

Study of radiation.—This article, read before a general medical body, gives a review of the history and development of radiation therapy, with special reference to high voltage X-ray. It deals briefly and very lucidly with the problems of wave lengths and methods of measurement ordinarily employed, the matters of filters, scattered rays, dangers from indiscriminate use, and action of X-rays on tissues. The mechanical and biological problems connected with treatment of malignancies of several kinds are discussed.

The author insists that the newer ideas about X-ray therapy are not designed to replace surgery, but to become a more valuable adjunct to surgical methods, so that the surgeon and radiologist should work in closest harmony and co-operation.

W. W. WATKINS, M.D.

The New Deep X-ray Therapy and Its Application in Treatment of Malignancy. U. V. Portmann. Ohio St. Med. Jour., March, 1924.

Ureteral obstruction.—It is not the writer's object to inject into the nephropathic situation the problem of ureteral obstruction, without a reason. He desires to call attention to the frequent occurrence and congenital aspect of ureteral lesions, and to point out the regularity with which ureteral obstruction in some degree can be demonstrated in these cases of upper urinary tract disease, whether a hydronephrosis, a pyelitis, a pyelonephritis, or a pyelonephrosis. In many of these cases with immense dilatation and infection of the ureter and renal pelvis, seen primarily in the "end-result" stage, the early pathology remains in doubt. But if one keeps in mind the fact that congenital obstruction or stasis is the prime factor in the development of infection, he believes that we may safely conclude that these factors are operative in the development of the conditions.

Finally, it is the early recognition and relief of these obstructions before extensive damage occurs that is the key to the situation, rather than treatment in the later stages, in which it is evident that the probability of repair is meager.

L. R. SANTE, M.D.

Lesions of the Ureter, with Special Reference to Obstruction and Infection. Clinton K. Smith. Surg., Gyn. and Obst., April, 1924, p. 509.

Roentgen treatment.—The article opens with a lengthy discussion of Dessauer's point-heat-theory. This is followed by a report on the diminution of the cholesterin content of the blood and blood serum under the influence of roentgen radiation. Data as to the effect of varying dosage on this change are lacking. Then follows a discussion of the proposed cell membrane and its qualities, of the possibility of the influence of rays on lecithin, cholesterin, chromatin and protoplasm. The most valuable remark in the article is, that so many observers, in their experimental investigations and their valuation, con-

fuse cause with effect. Unfortunately the author himself seems to be guilty of this mistake. Thus, in his conclusion, he justly quotes Roentgen, when he says: "Science is malicious." The conclusions, which were deduced from the valuable recognition of the diminution of the cholesterin content of the blood under roentgen ray treatment, are overdrawn, in our estimation, considering the limitations of the material so far available.

HANS A. JARRE, M.D.

The Influence of Roentgen Rays on Endocellular and Metabolic Activities. O. Strauss (Berlin). Strahlentherapie, XVI, No. 2, 1923, p. 195.

Knee-joint injuries.—A detailed consideration is given to the treatment of a large number of knee-joint injuries.

1. *Lacerations of the synovial membrane:* These are frequently associated with large hemorrhages but no injury to the bone. Aspiration of blood and Buck's extension are sufficient.

2. *Lacerations of the anterior and posterior crucial ligaments:* These are often satisfactorily treated by immobilization. If associated with a fracture of the spine or the tibia, open operation may be necessary.

3. *Rupture and traumatism to the fibrous capsule:* This should be repaired surgically.

4. *Tears of the ligamentous structures* outside of the knee-joint proper also call for surgical procedure.

5. *Injuries to the tendons surrounding the knee-joint:* Fracture of the patella and other fractures should be treated as indicated in the part fractured.

6. *Trauma to the bursæ about the joint:* For puncture wounds without infection the treatment of rest and immobilization is sufficient. If infected, this must be dealt with.

The management of knee-joint injuries resolves itself into four distinct equations:

1. A proper diagnosis of the lesion, made from the history of the case and physical and X-ray examinations. A study of the mechanism of the accident and a thorough knowledge of the anatomy of the tissues involved are necessary to enable the surgeon to make his decision. The diagnosis of the X-ray should be made only from a stereoscopic plate.

2. The surgical procedure involves a careful reapposition of injured tissue, whether it be osseous, cartilaginous, or tendinous, and if this is not feasible, a removal of that portion which cannot be utilized or is foreign to the joint, and, if necessary, a substitution of bone or fibrous tissue from some other part of the body.

3. Operative measures upon a joint must be carried out with the strictest aseptic technic and at such time as Nature's walling off or cofferdamming is complete. There is no longer any reasonable excuse for introducing into the joint the operator's finger, any instrument, appliance or sponge which is not absolutely sterile. The joint tissue is as sensitive and unprotected against infection as the eye, and reacts badly to excessive manipulation or trauma.

4. The after-care requires the use of such appliances as are necessary to hold the tissue in position. Active and passive motion should be sufficiently early to avoid excessive adhesions and not so late as to permit peri-articular fixations to form. The application of physiotherapeutic measures, especially diathermy and heliotherapy, should be utilized to the fullest extent.

L. R. SANTE, M.D.

Knee-joint Injuries and Their Management. Philip H. Kreuscher. Ann. Surg., July, 1924, p. 69.

Experimental production of gall-bladder carcinoma.—After studying the statistics of many writers the author concludes that over 10 per cent of adults have gallstones, that 5 per cent of these develop cancer of the gall bladder, and that gallstones are present in practically all cases of gall-bladder cancer. These findings are good grounds for believing that cancer of the gall bladder is the result of the irritation set up by the gallstones. On the other hand, some men believe that the calculi found in cases of carcinoma are the consequence of carcinoma and not the cause.

In the author's experiment, one or two gallstones were inserted directly into the gall bladders of each of 25 guinea pigs. These gallstones were about the size of lentils and had been removed four years previously from a patient with cholelithiasis, and had been kept in a dry state. In five other cases, small smooth pebbles sterilized beforehand were used; in another batch of five pilules of pitch were inserted.

RESULTS

Soon after the introduction of the solid foreign bodies there is a denudation of the epithelium lining the viscus, followed later by regeneration from the portions of the gland set deeper in the wall. The activity of this tubular epithelium, accompanied by activity of the stroma, becomes more and more marked, the constant trauma exerted by the foreign body, perhaps accentuated by efforts at expulsion, producing repeated destruction of the surface epithelium, and repeated replacement from gland epithelium. In some cases a state of equilibrium is attained, the wall of the gall bladder either being restored to its normal condition, with the

calculus lying free in the cavity, or, owing to formation of fibrous tissue, contracting down tightly over the stone, when proliferation ceases.

In the majority of instances, however, the epithelial activity continues. Only when neighboring tissues were invaded, was the process considered malignant. In these experiments the liver became involved by continuity and not by metastases.

In histological preparations it is not always possible to distinguish a bile ductule from an invading tubule, but the great irregularity of the proliferation in most cases leaves little room for doubt. From the mass in the liver or more directly from the gall bladder itself, the diaphragm or abdominal muscles in the vicinity are invaded, and the process in its extension destroys the ribs, forming a perceptible subcutaneous nodule. The involvement of the omental fat shows the true invasive character of the growth, and here the cells have entirely lost their tendency to associate in tubule formation. It should be noted that the absence of distant metastases and the spread of the process by continuity are quite usual features in carcinoma of the human gall bladder.

From the results of these experiments the author concludes that, in the human subject, gallstones are capable of causing cancer of the gall bladder.

SOLOMON FINEMAN, M.D.

Gallstones and Cancer of the Gall Bladder. Archibald Leitch. Brit. Med. Jour., Sept. 13, 1924, p. 451.

Statistics of cancer cases.—The author presents in some detail and with numerous statistics the final results in three large groups of carcinoma, *i.e.*, cancer of the skin of the face, cancer of the lips, and cancer of the uterine cervix.

Skin cancer is divided into two main groups: the superficial tumors which are restricted to the skin and subcutaneous tissue and are freely movable against the subjacent tissue, and infiltrating tumors which are fixed to the subjacent tissue. Of 102 superficial tumors, cures have been obtained in 88 cases, or 86.3 per cent of the entire group. In the infiltrating tumors the ratio of cure is only 51.4 per cent, or 54 out of 105 cases. Considering all the cases of skin cancer, both the entirely inoperable ones and those which have not fulfilled their treatment, the absolute ratio of cure will be 68.6 per cent, as 142 out of 207 patients have remained cured. It appears that the clinical form of the tumor, its extension and its mode of growth play a dominating rôle in the prognosis. Also the topographical location is a determining factor for the prognosis, at least as far as the infiltrating tumors are concerned. When the tumor is situated in a comparatively smooth surface with an even subjacent tissue, as in the cheek, the chin, the temple, and the forehead, the ratio of cure has been 64.5 per cent in the cases of infiltrating tumors; whereas the ratio of cure in cases of infiltrating tumors around the eye and external ear drops to about 45 per cent. This is due to the technical difficulties in the application of the radium, as well as the tendency of the tumor to infiltrate more rapidly the bony tissue when invading regions of a more complicated structure.

The author has divided cancer of the lower lip into the superficial and infiltrating varieties, and there is a great difference as to the results in each. Out of 40 cases of superficial tumors, 36 cases, or 90 per cent of the entire group, have remained cured. But only in 9 of 26 cases of infiltrating tumors, or 34 per cent, was there a permanent cure. The absolute ratio of cure for the entire group of cancer of the lower lip will be 45 out of 66 cases, or 68 per cent, when the 14 inoperable cases, as well as the 6 cases that abandoned treatment, are counted. All age groups show about the same ratio of cure in superficial tumors of the skin. In infiltrating tumors, on the other hand, the ratio of cure falls with increasing age.

Both in cancer of the face and in cancer of the lower lip the superficial recurrences following surgical intervention are cured to the same extent as are primary tumors. On the other hand, recurrences which are growing infiltratively have a much poorer prognosis than primary tumors of a similar nature. Of 76 primary infiltrating tumors of the skin, 45 cases, or 59 per cent, have remained cured, whereas of the 29 infiltrating recurrences following surgical intervention, only 9 cases, or 31 per cent, have been permanently cured. With regard to cancer of the lower lip, 29 cases, or 59 per cent, of 49 primary infiltrating tumors have remained cured, whereas only 3 cases, or 13 per cent, of 22 recurrences after operation have been permanently cured. The prognosis of infiltrating post-operative recurrences is therefore very poor, when only a radiological treatment is administered.

In 15 cases with obviously cancerous regionary glands, a combined surgical and radiotherapeutic treatment was carried out. In all, two-thirds of the cases treated in this manner have remained free from symptoms. The period of observation is, however, too short to permit any definite conclusion. On the basis of the present experience the author advocates this combined technic of therapy in all clinically cancerous glands that are still operable.

An analysis of the duration of cure in all cases of skin cancer cured between 1910 and

1915 shows that 76 cases, or 53.5 per cent, have been observed cured for from five to thirteen years. In 29 cases, or 20.5 per cent, the cure has been observed from two to four years and in 37 cases, or 26 per cent, the cure has been verified during one year or less.

In the cases of cancer of the lower lip there was observed a cure lasting from five to thirteen years in 38 out of 45 cases, or 84.4 per cent; in 6 cases, or 13.3 per cent, during two to four years; and only in 1 case for less than a year.

Recurrences following radiological cure in superficial forms of cancer of the skin and lower lip occur in about 10 per cent of the cases, and the majority of these recurrences are to be expected during the first year or at any rate within three years. In infiltrating tumors of the skin and lip recurrences following apparent radium cure seem to appear in from one-fifth to one-third of the cases, and their latent period seems to be longer than in superficial cases, though the majority of recurrences set in within the first three years.

From a series of 505 cases of carcinoma of the cervix treated between 1914 and 1921, 40.5 per cent of the operable and borderline cases have been symptom-free at the end of five years. Of the inoperable cases, 16.6 per cent have been symptom-free after five years, and 20 to 25 per cent of the remaining inoperable cases which have not been permanently cured have remained symptom-free for at least three years. From these figures the author concludes that a permanent cure can be produced by radium in about 25 to 30 per cent of all treated cases of carcinoma of the uterine cervix, which figure is quite comparable to the operative results. As a rule recurrences have appeared within the first year, whereas glandular metastases and remote metastases have manifested themselves after several years of apparent health. Recurrences following radiological treatment, like recurrences following surgical intervention, are extremely invulnerable to radiotherapy.

J. D. CAMP, M.D.

Experiences in the Permanency of Radiological Cure in Cancer. Gosta Forssell. Am. Jour. Roentgenol. and Rad. Ther., Oct., 1924, p. 301.

Ovarian transposition.—The living ovary is included in the thickness of the uterine muscle, projects partly into the uterine cavity, and is studded with corpora lutea. The ovarian tissue contains a voluminous cyst of ovular origin and a considerable number of microcysts with graafian follicles. The uterine mucosa, normal throughout, makes a little polypoid projection at the level of the ovarian "relief." On microscopic section the chorion is notably hypertrophic and the glandular convolutions of the mucosa are greatly hypertrophied. One is in the presence then of a moderate adenomatous evolution, circumscribed, and of a still benign appearance.

From these facts, it is justifiable to transpose an ovary with its pedicle into the uterine cavity in order to preserve menstruation and the possibility of impregnation in women who have undergone double salpingectomy. Sterility due to lesions which are seemingly benign or unrecognized is so frequent that it opens up a possibility for the application of this operative measure. In 23 operations from August 7, 1922, to January 15, 1924, the essayist has had no deaths. He has seen two post-operative hemorrhagic extravasations, coming from the section of the broad ligament on the side opposite the transposition. He has done one laparotomy and, after checking the hemorrhage, has had two patients get well.

The after-results have been excellent in 21 cases. He has reported and shown the specimens of the two late hysterectomies which he has been obliged to perform, one for intestinal obstruction not related to the ovarian transposition. The two patients are perfectly well. These accidents were due to imperfections inseparable from the evolution of a new technic.

W. W. WASSON, M.D.

Transposition of the Ovary with Its Vascular Pedicle into the Uterus After Salpingectomy. Theodore Tuffier. Surg., Gynec. and Obst., Oct., 1924, p. 401.

Knee-joint surgery.—In many clinical conditions, a high percentage of disabled knees may be returned to normal knee-joint function by appropriate surgical interference. In certain disease processes, notably tuberculosis, operation upon the knee offers the one sure method of cure. Here the operation should have for its object the establishment of ankylosis. Until such time as the treatment of tuberculosis by heliotherapy has been perfected and made practical, this would seem to be the better position to hold.

In certain disease processes, notably the acute infections of the knee, operations to clean the joint cavity, or to establish drainage, hold the only promise of conservation of knee-joint function.

Functional use of the lower extremity may be well carried out with a stiff, strong, weight-bearing knee. Functional use of the lower extremity is inhibited or lost if the knee be insecure, painful, or partially functioning. The dangers that come with an insecure knee are not insignificant. The menace that shadows the life of an individual with a tuberculous knee is very real. It is possible by surgical measures

to restore the lost function to a knee joint. It is also possible by surgery to aid Nature in healing the diseased knee.

W. W. WASSON, M.D.

The Surgery of the Knee Joint. Nathaniel Allison. Surg., Gynec. and Obst., Oct., 1924, p. 409.

Radiation and excision. — At the Mayo Clinic, for many years X-ray has been used following operations for breast cancer, to produce tissue reactions which will retard the growth of recurrences and in the hope that it might kill the carcinomatous cells at the site of operation. Without special statistical data to bear out the opinion, it is believed that no special good comes from using radium or X-ray just prior to operation.

It is intended to treat a group of patients with radium as though no surgery were to follow, and then operate two or two and a half months later as if no radium had been used. Since good results have come from treating patients both with radium and surgery, all patients should be given the benefit of both agents when possible.

W. W. WATKINS, M.D.

Radiation in the Female Breast Before and After Operation. Walter E. Sistrunk. Southern Med. Jour., March, 1924, p. 201.

Protective booths.—Lead, lead-rubber, lead-glass and barium plaster are photographically and iontometrically examined for their equivalent protective capacity against X-rays of 180-220 K.V. It is thus found that the relative ratio of their efficiency, using a narrow cone (5 grm.) is as 1:3:8.5 ÷ 10:13-14. The actual amount of protection obtained is reduced in praxis because of the secondary rays to: lead 1:1, 6; lead-glass 1:1, 7; barium plaster 1:2, 1.

This fact has to be taken into consideration in the manufacture of protective booths. The actual diminution of the strength of the rays is measured in passing through layers of lead of 1-4 mm. at a maximum tension of 215-220 K.V.

CONCLUSIONS

(1) Taking into consideration the scattering of rays and secondary radiation, a minimum thickness of 4 mm. of lead, 36 mm. of lead-glass and 60 mm. of barium plaster is required for adequate protection.

(2) A protective cabinet, closed in on all sides, is preferable to a more or less curved protective screen.

HANS A. JARRE, M.D.

The Efficacy of Protective Substances Against X-rays. R. Berthold (Stuttgart). Strahlentherapie, XVI, No. 1, 1923, p. 147.